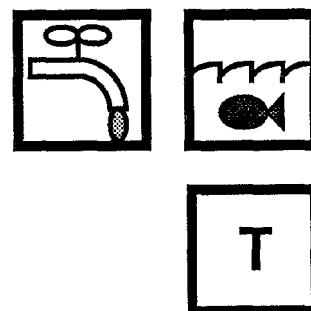


SECTION 8.9

BLENDED WATER

SUPPLIES



This section presents guidance and background information regarding the evaluation of the population factor for the drinking water threat when a surface water intake is part of a blended water supply system. The population factor for the drinking water threat is evaluated based on the level of contamination (i.e., Level I, Level II, and potential contamination), the number of people, and for potential contamination, the flows (or depths) at surface water intakes within the TDL. In some instances, discrete populations can be linked directly to individual intakes. In other cases, water from multiple intakes (or multiple intakes and ground water wells) is blended together prior to or during distribution to a target population. The HRS specifies a method for apportioning the total population served by such a system among the units (i.e., intakes, wells, or mains) making up the system.

The HRS provides for dividing a target population equally among all the water supply units that contribute to the blended system, as long as no single supply (i.e., intake, well, or main) contributes more than 40 percent (based on average annual pumpage or capacity) of the total supply. If any one unit provides more than 40 percent, the percentage contributed by each of the water supply units needs to be determined. Under these circumstances, each intake or well is assigned a percentage of the population based on its relative contribution.

RELEVANT HRS SECTIONS

Section 4.1.2.3	Drinking water threat — targets
Section 4.1.2.3.2	Population

DEFINITIONS

Blended Water Distribution System: A drinking water supply system that can or does combine (e.g., via connecting valves) water from more than one well or surface water intake, or from a combination of wells and intakes.

Capacity: The amount of water a well or intake can deliver to a water distribution system. Capacity may be expressed in units that are equivalent to a pumpage rate or as a percentage of the system's requirements.

Pumpage Data: A measure of the volume of water per unit of time discharged from a well, or collected within an intake, either by pumping or free flow. Well pumpage is commonly measured in gallons per minute (gpm), cubic meters per day (m³/day; 1 gpm = 5.45 m³/day), or cubic feet per second (cfs; 1 gpm = 0.0023 cfs). Pumpage data may also be termed well production data, well discharge data, well flow data, well yield data, pumping line data, and for intakes, intake pipe flow data. For HRS purposes, pumpage data relate to the measured or estimated rate of water withdrawal from a well or intake, not from a storage tank or reservoir used as a receptor for water drawn from one or more wells and/or intakes. See **Highlight 8-36** for more information on pumpage data.

HIGHLIGHT 8-36 PUMPAGE AND CAPACITY DATA

Data on the contribution of each intake or well to the total blended water system may be supplied in several forms, including pumpage or capacity. All data used to evaluate a given system for the purposes of apportioning population should be of the same type (e.g., do not use capacity data for some intakes or wells and pumpage data for others). In addition, the data must be in the same units. An abbreviated conversion table is provided below.

1 gal/min	= 0.00223 ft ³ /sec	= 5.45 m ³ /day
1 ft ³ /sec	= 448.8 gal/min	= 2,447 m ³ /day
1 m ³ /day	= 4.09 x 10 ⁻⁴ ft ³ /sec	= 0.183 gal/min.

Pumpage. Many water authorities keep pumpage records expressed as the total quantity of water pumped in a given interval, usually a day, month, or year, not in terms of pumpage for the period during which a well is used. Metered pumpage data are the most reliable and, therefore, the preferred type of data. However, estimates of pumpage calculated by the water authorities based on engineering parameters built into the well or intake design, construction, and pump configuration may also be acceptable.

Capacity. The sum of the capacities may represent more than the total needs of the system. The relative capacity of each component, however, may be calculated by dividing the capacity of the component by the sum of the capacities of all the components. This normalization procedure means that the sum of the relative capacities of all the components in the system will total 100 percent.

Standby intakes. When using pumpage data for a standby surface water intake, use average pumpage for the period during which the standby intake is used rather than average annual pumpage (HRS section 4.1.2.3.2). See Section 8.10 for additional information.

Standby Intake: A surface water intake held in reserve by a water supply entity (e.g., agency, authority, cooperative, private company, or individual) and maintained for use. It is designated as a drinking water supply to be used during a water supply shortage or emergency such as pump failure, drought, sudden water quality deterioration, or interruption in the regular supply.

Standby Well: A well held in reserve by a water supply entity (e.g., agency, authority, cooperative, private company, or individual) and maintained for use. It is designated as a drinking water supply well for use during a water supply shortage or emergency such as pump failure, drought, sudden water quality deterioration, or interruption in the regular supply. Additional terms commonly used to signify standby wells include reserve wells, drought wells, safety wells, emergency wells, backup wells, substitute wells, and uncommitted wells.

Population for the Drinking Water Threat: Number of residents, students, and workers regularly served by surface water intakes that are located within the TDL for the surface water bodies evaluated for a given watershed. This population does not include transient populations, such as hotel and restaurant patrons, but may include seasonal populations (e.g., a resort area).

SCORING THE POPULATION FACTOR FOR BLENDED WATER SUPPLIES

The steps described below outline the procedures for evaluating the population factor for blended water supplies. **Highlight 8-37** summarizes the data needed for the evaluation.

HIGHLIGHT 8-37

DATA NEEDS FOR EVALUATING BLENDED SYSTEMS

The typical data used to document the evaluation of the population factor when blended water systems are involved may include all of the following:

- Identification of all the water supply entities with intakes within the TDL.
- Number and location of water supply units (i.e., surface water intakes, ground water wells, standby/emergency supplies) and flow (or depth) data for surface water intakes subject to potential contamination.
- Specifics of the water distribution system:
 - Geographic extent
 - Number and types of connections (residential, industrial, commercial)
- Pumpage and/or capacity data for intakes and wells expressed in comparable units.

Much of the information required to evaluate blended water systems can be collected directly from the water supply entities or local regulatory authorities. In addition, because some of the required information relates specifically to water resources studies, the district office of the Water Resources Division of the USGS and its counterpart in the state should be contacted as necessary. These sources may provide more detailed well and flow data through such publications as their Water Resources Investigation series, the Hydrologic Atlas series, and annual reports on specific river basins.

- (1) **Identify all blended water supply systems that may have drinking water intakes within the TDL.** If more than one blended system is present, repeat Steps (2) through (6) for each system. If a blended system supplies water to another blended system or receives water from another blended system, refer to the subsection, Scoring Multiple Blended Systems.
- (2) **Identify all water supply units (i.e., intakes and/or wells) for the blended system.** Identify all water supply units of the blended system including units within and outside the TDL. The water supply units may include surface water intakes, ground water wells, and standby/emergency supplies. Mark the location of each intake or well relative to the site on a scale map or diagram.
- (3) **Determine which intakes will be evaluated as targets for the population factor.**
 - Although all water supply units must be identified to apportion population, include only intakes that are within the TDL for the watershed in scoring the population factor. Remember that any intake subject to actual contamination is evaluated regardless of its distance from the site.
 - If the blended system includes standby intakes, include or exclude some, all, or none of the standby intakes to obtain the highest population factor value. Exclude all standby ground water wells. See Section 8.10 for more detailed guidance on evaluating standby intakes.
- (4) **Determine the total number of persons served by the blended system.** If the data are provided in terms of service connections rather than persons served, multiply the number of service connections by the average number of persons per residence for the county.

- (5) **Determine whether any single intake or well supplies more than 40 percent of the system's water.** Base this determination on average annual pumpage or capacity data.
- (6) **Apportion the population served by the blended system as follows:**
 - If no single intake or well supplies more than 40 percent of the system's water, apportion the population equally to all intakes and wells in the system (i.e., divide the total population by the number of intakes and wells).
 - If a single intake or well supplies more than 40 percent of the system's water, apportion population to each intake or well based on the percentage of water it supplies. Use average annual pumpage or capacity to determine the percentage of water each intake or well supplies.
- (7) **Tabulate the population assigned to intakes within the TDL.** Add this population to any other target population (e.g., from other independent or blended systems) to evaluate the drinking water population factor for the watershed. See Section 8.8 for detailed information on scoring the population factor.

Highlights 8-38 and **8-39** provide examples of scoring the population factor for blended water systems.

SCORING MULTIPLE BLENDED SYSTEMS

Some blended water systems receive water from (or supply water to) another blended water system via one or more water mains. The steps below describe how to apportion population to each supply intake or well in such cases. The blended system that receives water is referred to as System R; the blended system that supplies water is referred to as System S. If two or more blended systems supply water to each other, evaluate the systems as one combined blended system; do not use the steps below.

APPORTION POPULATION SERVED BY RECEIVING SYSTEM (SYSTEM R)

When evaluating a blended system that receives water from another system, include the water mains through which the system receives water as water supply units (i.e., treat as a well or intake).

- (1) **Determine population served by System R.** This step is identical to that for a normal blended system.
- (2) **Identify all water supply units for System R.** The water supply units are ground water wells in System R, surface water intakes in System R, and water mains from System S. Each water main is treated in the same manner as one well or intake.
- (3) **Determine whether any single System R water supply unit provides more than 40 percent of System R's total water.** Consider all wells and intakes in System R, and all water mains from System S.
- (4) **Apportion the population in System R as follows:**
 - If no water supply unit supplies more than 40 percent of the system's water, apportion the population equally to each water supply unit in System R.
 - If a water supply unit supplies more than 40 percent of the system's water, apportion population to each water supply unit based on the percentage of water it supplies. Use average annual pumpage or capacity to determine the percentage of water each well, intake, or water main supplies.

HIGHLIGHT 8-38

SCORING EXAMPLE OF SINGLE BLENDED SYSTEM WITH INTAKES OUTSIDE OF THE TARGET DISTANCE LIMIT

Site Setting: The site is located in a suburban community, close to a river. The river is subject to potential contamination, and a PPE has been identified. For HRS purposes, the river is classified as a "large stream to river" (i.e., flow of > 1,000 to 10,000 cubic feet per second) at both intakes within the TDL (see HRS Table 4-13).

Water Supply: Three surface water intakes and three groundwater wells supply water to a blended system prior to distribution.

Location of Water Supply

- One intake 2 miles downstream of the PPE;
- One intake 5 miles downstream of the PPE;
- One intake 2 miles upstream of the PPE; and
- Three wells in a well field adjacent to the site.

Population Served: The water authority reports 80,000 connections.

The population density in the county in which the site is located is 2.5 persons per residence. Assuming all residential connections:

Population served = 80,000 x 2.5 = 200,000 people.

Evaluation: No Level I or Level II contamination is identified. Evaluate population based on potential contamination. The water authority reports no intake or well contributes more than 40 percent of its total need. Therefore, assign 33,333.3 people (200,000/6) to each intake and well in the system.

66,666.6 people are assigned to the two intakes within the TDL, which are on a water body of the type "large stream to river."

Using HRS Table 4-14, the dilution-weighted population value is 52.

Potential contamination factor value (to nearest integer) = $1/10 \times 52 = 5$

Population factor value = 5

HIGHLIGHT 8-39

SCORING EXAMPLE OF TWO SEPARATE BLENDED SYSTEMS

Site Setting:	The site is located in a densely populated urban center.						
Water Supply:	<p>Two water authorities (Systems A and B) with separate water treatment plants and separate distribution systems.</p> <ul style="list-style-type: none"> • System A is supplied by five surface water intakes. • System B is supplied by three surface water intakes and one ground water well. 						
Location of Water Supplies:	<p>All intakes are within the TDL for surface water.</p> <p>System A's intakes are located on a river with an average annual flow of 25,000 cfs (a "large river" by HRS definition from Table 4-13).</p> <p>System B's intakes are located on a river with an average annual flow of 8,000 cfs (a "large stream to river" by HRS definition from Table 4-13).</p>						
Population Served:	<p>The population density in the county served by the water systems is 2.5 persons per residence.</p> <p>Water authority A reports 100,000 residential connections.</p> <p style="padding-left: 40px;">Population served by System A = $100,000 \times 2.5 = 250,000$ people</p> <p>Water authority B reports 40,000 residential connections.</p> <p style="padding-left: 40px;">Population served by System B = $40,000 \times 2.5 = 100,000$ people</p>						
Evaluation:	<p>No Level I or Level II contamination is identified. Evaluate population based on potential contamination. Both water authorities report that no well or intake contributes more than 40 percent of their total needs.</p> <p>Assign 50,000 people ($250,000/5$) to each of the five intakes in System A. Because all intakes are on the same water body and are within the TDL, all 250,000 people in System A are evaluated for a "large river."</p> <p>Assign 25,000 people ($100,000/4$) to each of the three System B intakes and the System B well. 75,000 people from System B (3 intakes \times 25,000) are evaluated for a "large stream to river." Do not include the population served by the ground water well when calculating the surface water population factor value.</p> <p>The dilution-weighted population values are as follows (from HRS Table 4-14):</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding-left: 40px;">Value for 250,000 people served by intakes on a "large river"</td><td style="text-align: right; vertical-align: bottom;">16</td></tr> <tr> <td style="padding-left: 40px;">Value for 75,000 people served by intakes on a "large stream to river"</td><td style="text-align: right; vertical-align: bottom;">52</td></tr> <tr> <td style="padding-left: 20px;">Total dilution-weighted population value.</td><td style="text-align: right; vertical-align: bottom;">68</td></tr> </table> <p>Potential contamination factor value (to the nearest Integer) = $1/10 \times 68 = 7$</p> <p>Population factor value = 7</p>	Value for 250,000 people served by intakes on a "large river"	16	Value for 75,000 people served by intakes on a "large stream to river"	52	Total dilution-weighted population value.	68
Value for 250,000 people served by intakes on a "large river"	16						
Value for 75,000 people served by intakes on a "large stream to river"	52						
Total dilution-weighted population value.	68						

- (5) **Determine which System R intakes are within the TDL and tabulate the population served.** In determining the population served, consider only the population apportioned to intakes within the TDL. Tabulate only the population served by System R intakes. Do not include the population apportioned to mains from System S. As with all blended systems, the population is tabulated by level of contamination and, for intakes subject to potential contamination, by dilution weighting category.

APPORTION POPULATION SERVED BY THE SUPPLYING SYSTEM (SYSTEM S)

When calculating the total population served by a blended system that supplies water to another blended system, include the total population served by the supplying system.

- (1) **Determine the total population served by System S.** This population includes all people served by System S plus some of the people served by System R.
- (6) Refer to Step (4) above for the number of people served by System R that were apportioned to each System S water main.
- (7) Add this number to the population served directly by System S to calculate the total population served by System S.

After the total population served by System S is calculated, the water mains are not considered further in the evaluation for System S.

- (2) **Identify all water supply units for System S.** The water supply units are ground water wells in System S and surface water intakes in System S. The water mains to System R are not water supply units for System S.
- (3) **Determine whether any single System S well or intake supplies more than 40 percent of the water for System S.**
- (4) **Apportion the population in System S as follows:**
- If no well or intake supplies more than 40 percent of the system's water, apportion the population equally to all wells and intakes in the system.
 - If a well or intake supplies more than 40 percent of the system's water, apportion population to each well or intake based on the percentage of water it supplies. Use average annual pumpage or capacity to determine the percentage of water each well or intake supplies.
- (5) **Include the population apportioned to any System S intake within the TDL in the tabulation of population served.** As with all blended systems, the population is tabulated by level of contamination and, for intakes subject to potential contamination, by dilution weighting category.

An example of apportioning population to two blended systems in which one is supplying water to the other is provided in ***Highlight 8-40***.

HIGHLIGHT 8-40

SCORING EXAMPLE FOR MULTIPLE BLENDED SYSTEMS

Water Supply:	System S:	Blends water from four intakes; no intake provides >40 percent of the system's water.
	System R:	Blends water from four intakes and receives water from System S via 1 water main; no intake or main provides >40 percent of the system's water.
Location of Intakes:	System S:	Two intakes are within 10 miles downstream from the PPE. The other two intakes are outside of the TDL.
	System R:	All four intakes are within 10 miles downstream from the PPE.
	All intakes within the TDL for both systems are subject to Level II contamination.	
Population Served:	System S:	10,000 people
	System R:	20,000 people
Evaluation:	Apportion Population Served by Receiving System - System R	
	Number of water supply units = 4 Intakes + 1 main = 5 units	
	People/unit = 20,000/5 = 4,000	
	Assign 4,000 people to each System R intake and the water main from System S.	
	Apportion Population Served by Supplying System - System S	
	Total Population = 10,000 (System S) + 4,000 (System R) = 14,000	
	Number of water supply units = 4 intakes	
	People/unit = 14,000/4 = 3,500	
	Assign 3,500 people to each System S intake.	
Population Factor:	Two System S intakes within TDL = 7,000 people	
	Four System R intakes within TDL = 16,000 people	
	Total Level II concentrations factor value = 23,000	
	Population factor value = 23,000	

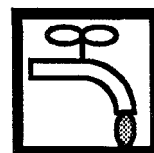
TIPS AND REMINDERS

- If no single intake or well supplies more than 40 percent of a system's total needs, apportion the population equally to all intakes and wells even if more definitive information is available.
- Allocate population served to each well or intake in a blended system, but only include as targets those populations allocated to intakes located within the TDL for the watershed.
- When two or more blended systems regularly provide water to each other, evaluate the systems as one combined blended system.

SECTION 8.10

STANDBY

INTAKES



This section defines standby intakes and associated terms, provides guidance and background information on the use of standby intakes to evaluate certain factors within the targets factor category of the drinking water threat, and explains how to apportion population to standby intakes. Standby intakes in the drinking water threat are treated in the same manner as standby wells in the ground water pathway. A standby intake that meets certain criteria may be used to score the nearest intake and/or the population factors. To designate a standby intake as the nearest intake, it must be used for drinking water supply at least once a year. In order to include a standby intake when evaluating the population factor, the intake must be maintained regularly so that water can be withdrawn. Standby intakes are not considered in the evaluation of the resources factor.

RELEVANT HRS SECTIONS

Section 4.1.2.3.1	Nearest intake
Section 4.1.2.3.2	Population

DEFINITIONS

Annual Use: Criterion for determining whether a standby intake may be used to evaluate the nearest intake factor. To meet this criterion, a standby intake generally should supply drinking water for at least one 24-hour period in a year.

Regular Maintenance: The routine inspection, cleaning, and testing of a standby intake so that it can be ready for immediate use. This is a criterion for determining whether a standby intake may be used to evaluate the population factor. Regular maintenance of a standby intake may include direct measurement of (or knowledge of) the surface water level, inspection of intake screen and pump, and testing of the pump. Such activities generally should be conducted at least once a year and the operating authority should consider the intake functional. Rehabilitation activities, with the intent of retaining a standby intake in a state of readiness, also can be considered regular maintenance. Such activities include pump cleaning and lubricating or screen cleaning.

Standby Intake: A surface water intake held in reserve by a water supply entity (e.g., agency, authority, cooperative, private company, or individual) and maintained for use. It is designated as a drinking water supply to be used during a water supply shortage or emergency, such as pump failure, drought, sudden water quality deterioration, or interruption in the regular water supply.

Water Withdrawal Rotation Program: Program in which intakes within a water supply system are used only for specified intervals, after which other intakes or wells are used. Rotation programs are designed to minimize drawdown interference and to maximize efficient use of

water in relation to varying water demand. Do not consider an intake that is part of a planned water withdrawal rotation program a standby intake

Nearest Intake Factor: Factor for evaluating the maximally exposed intake. This factor is based on the presence of actual contamination or, for watersheds where no intake is subject to actual contamination, the flow or depth of the water body at the intake nearest to the PPE within the TDL.

Population for the Drinking Water Threat: Number of residents, students, and workers regularly served by surface water intakes that are located within the TDL for the surface water bodies evaluated for a given watershed. This population does not include transient populations, such as hotel and restaurant patrons, but may include seasonal populations (e.g., a resort area).

Pumpage Data: A measure of the volume of water per unit of time discharged from a well, or collected within an intake, either by pumping or free flow. Well pumpage is commonly measured in gallons per minute (gpm), cubic meters per day (m³/day; 1 gpm = 5.45 m³/day), or cubic feet per second (cfs; 1 gpm = 0.0023 cfs). Pumpage data may also be termed well production data, well discharge data, well flow data, well yield data, pumping line data, and for intakes, intake pipe flow data. For HRS purposes, pumpage data relate to the measured or estimated rate of water withdrawal from a well or intake, not from a storage tank or reservoir used as a receptor for water drawn from one or more wells and/or intakes.

Capacity: The amount of water a well or intake can deliver to a water distribution system. Capacity may be expressed in units that are equivalent to a pumpage rate or as a percentage of the system's requirements.

SCORING THE NEAREST INTAKE FACTOR USING STANDBY INTAKES

(1) Identify the standby Intake(s).

- Water supply entities generally refer to standby intakes by any of the following terms: standby intakes, reserve intakes, drought intakes, safety intakes, emergency intakes, backup intakes, substitute intakes, and uncommitted intakes.
- Even when one of the above terms is applied to an intake, the intake should not be considered a standby intake unless it meets HRS criteria.
- Standby intakes may be located either upstream of or downstream from the primary intake or even in a different watershed. They are commonly found where water works facilities have been upgraded or where municipalities have merged or collaborated to form a single water supply system.
- Some water supply entities utilize multi-level water withdrawal intakes at a single point in a lake or impounded portion of a river. One or more of these intakes may be used for water withdrawal on a regular basis, while other intakes may be designated for use only under critical water level conditions. Multi-level intakes with at least one level used on a regular basis should not be evaluated as standby intakes.

(2) Determine whether the standby Intake Is eligible to be used to score the nearest intake factor. The standby intake may be used if it meets both of the following conditions:

- The standby intake is within the TDL for the watershed being evaluated; and
- The standby intake has been used annually. It is not necessary to document that the intake has been used annually for the entire time it has been designated as a standby

intake. Documenting annual use in recent years (e.g., during the past five years) generally is sufficient. If the intake has been brought into a state of readiness only within the past few years, annual use since that time should be documented.

- (3) **Use an eligible standby intake as the nearest intake if it results in a higher nearest Intake factor value than any regular Intake.**

SCORING THE POPULATION FACTOR USING STANDBY INTAKES

- (1) **Identify the standby Intake(s).**

- (2) **Determine whether any standby intake is eligible to be used to score the population factor.** The standby intake may be used to score the population factor if it meets both of the following conditions:

- The standby intake is within the TDL for the watershed being evaluated; and
- The standby intake is receiving regular maintenance (as defined above). If a standby intake meets the annual use criterion for the nearest intake factor, it is likely to have also received regular maintenance.

- (3) **Evaluate the population factor with and without the standby intake(s).**

- For a system consisting entirely of surface water intakes within the TDL, including or excluding an eligible standby intake will only affect the score if the intake is at a different level of contamination or dilution weight from the regular intakes, or if it is in a different watershed.
- If there is more than one standby intake, calculate the population factor value for various combinations of intakes and wells. PREscore can be very useful for scenario testing. Each combination of wells and intakes must include:

S	All regular intakes and wells;
S	Some, all, or none of the standby intakes; and
S	None of the standby wells.

Note that the inclusion or exclusion of standby intakes may change the relative contribution of each water supply unit to the total water supply. In some cases, this may affect whether one well or intake provides more than 40 percent of the system's water.

- Do not double count by assigning the same population to both a standby intake and to a regular intake or well. Each segment of the population must be assigned to one and only one intake or well.
- When apportioning the population of a blended system based on pumpage data, use average pumpage (e.g., gallons per minute) for the period during which the standby intake is used, rather than average annual pumpage. **Highlight 8-41** provides additional information on pumpage and capacity data for standby intakes. Section 8.9 provides detailed guidance on scoring the population factor for blended systems.

- (4) **Choose the combination of regular and standby intakes that results in the highest population factor value.**

HIGHLIGHT 8-41

PUMPAGE AND CAPACITY DATA FOR STANDBY INTAKES

If no well or intake provides more than 40 percent of the total water supply for the system, simply apportion the population equally among the wells and/or intakes. However, if one intake or well provides more than 40 percent of the total water supply for the system, population must be apportioned according to each well's or Intake's share of the total supply. Consider the following points when apportioning population in a system with standby intakes where one water source provides more than 40 percent of the total supply.

- Use either capacity or pumpage data to calculate the percentage of the population to be assigned to each component of the system. Do not use pumpage data for one component and capacity data for other components. Data from standby intakes and regular intakes and wells must be in the same units.
- When using pumpage data for a standby intake, use average pumpage for the period during which the standby intake is used rather than average annual pumpage. The period during which a standby intake is on line but not actually pumping should not be considered part of the period during which the standby intake is used.
- Often pumpage data for standby intakes are not based on water flow meter readings, but reflect estimates based on pumping test data, pump size, orifice of effluent pipe, or duration of pump operation. Although metered pumpage data should be used whenever possible, pumpage may be estimated based on these or other appropriate parameters.
- If possible, attempt to calculate pumpage rates based on an average over the most recent periods of use. However, calculation of the pumpage rate for a standby intake can be based on a period of use several years ago.

Highlight 8-42 summarizes the data needed for evaluating standby intakes. **Highlight 8-43** provides an example of (1) calculating average pumpage for a standby intake and (2) calculating the relative contributions for a blended system including a standby intake. **Highlight 8-44** provides an example of scoring the population factor using a standby intake.

HIGHLIGHT 8-42 DATA NEEDS FOR STANDBY INTAKES

Contact local water supply entities (or regulatory authorities) directly to obtain the following data needed to evaluate standby intakes:

- Ensure that the Intake is one that is held in reserve to be used during a water supply emergency.
- Confirm that the intake has a working pump
- For the nearest Intake factor, document that the intake has been used annually (e.g., for a 24-hour period during a calendar year). Documenting annual use in recent years (i.e., during the past five years) generally is sufficient.
- For the population factor, document that the intake has been regularly maintained since established as a standby intake.
- Additional information (e.g., pumpage or capacity data) may be required when apportioning population to standby intakes and then using the standby intake to evaluate the population factor.

HIGHLIGHT 8-43 USING PUMPAGE DATA FOR STANDBY INTAKES

Standby Intake A standby intake is used for 28 days

Use: 30,240,000 gallons of water are drawn from the intake during the 28-day period

Calculation of Pumpage:
$$\frac{\text{Total pumpage for period of use}}{(\# \text{ days used})(24 \text{ hours/day})(60 \text{ minutes/hour})} =$$

$$\frac{30,240,000}{(28)(24)(60)} = 750 \text{ gpm}$$

Apportionment: Water from this standby Intake is blended with two regular Intakes that have pumpage rates of 1,600 gpm and 4,000 gpm respectively. The relative contribution of each is:

$$\begin{array}{rclcl} \frac{750}{(750 + 1,600 + 4,000)} & = & \frac{750}{6,350} & = & 12\% \\ \frac{1,600}{(750 + 1,600 + 4,000)} & = & \frac{1,600}{6,350} & = & 25\% \\ \frac{4,000}{(750 + 1,600 + 4,000)} & = & \frac{4,000}{6,350} & = & 63\% \end{array}$$

Because one intake provides more than 40 percent of the total supply, population apportionment is based on each intake's relative contribution to the total.

HIGHLIGHT 8-44

EVALUATING POPULATION FACTOR USING A STANDBY INTAKE

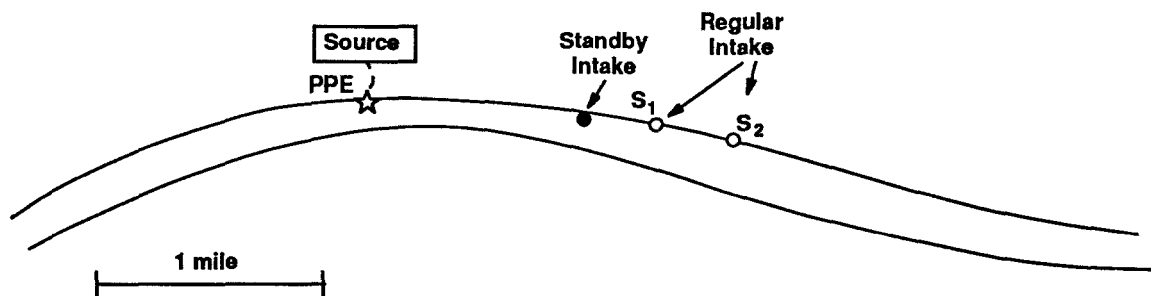
Site Setting: The site is in a suburban location with moderate population density.

Water Supply: The local water system utilizes two surface water intakes, S_1 and S_2 (each pumping at a rate of 1,500 gpm), along a small river and one ground water well (also pumping at a rate of 1,500 gpm) as part of a water withdrawal rotation program. Each is used as the primary drinking water source approximately one-third of the time, as part of a rotation program.

Another surface water intake (with a pump capacity of 1,500 gpm) is regularly maintained to serve as an standby supply.

Location of Water Supply: Regular surface water intakes are located between 1/2 and 1 mile (S_1) and between 1 and 2 miles (S_2) downstream from the site. The standby intake draws from a location near intake S_1 . Average flows at these intakes range from 8,000 to 9,000 cfs.

The ground water well, G_1 , is located between 1/2 and 1 mile from the site.



Population Served: The local water purveyor reports 2,400 residential connections.

The population density in the county in which the site is located is 2.5 persons per residence.

Total population served = $2,400 \times 2.5 = 6,000$

Evaluation: Evaluate the water withdrawal rotation system as a blended system. Level II concentrations have been documented at intake S_1 , well G_1 , and the standby intake. S_2 is subject to potential contamination only. The water authority reports that the capacity of the standby intake is sufficient to replace any interruption in either the ground water or regular surface water supply.

Alternative 1: Include the standby intake in apportioning population to the system.

Each of the four water supply units provides 25 percent.

Because none of the four provides more than 40 percent of the total water supply, assign one-fourth of the population ($1/4 \times 6,000 = 1,500$ people) to each well or intake.

- (1) **Sum the population served by surface water intakes subject to Level II concentrations.**

(continued on next page)

HIGHLIGHT 8-44 (continued)
EVALUATING POPULATION FACTOR USING A STANDBY INTAKE

1,500 (S_1 population) + 1,500 (Standby intake population) = 3,000

Level II concentrations factor value = 3,000

- (2) **Assign dilution-weighted population values from HRS Table 4-14 to surface water Intake subject to potential contamination (S_2).**

1,500 people served by an intake located on a river are assigned 2 points.

Potential contamination factor value = $(1/10)(2) = 0.2$

(Note that the HRS specifies that this value is not rounded if it is less than 1.)

- (3) **Add the values from Steps (1) and (2) to get the population factor value.**

$3,000 + 0.2 = 3,000.2$

Note: The 1,500 people assigned to the ground water well are not included as surface water pathway targets; they would be evaluated in the ground water pathway.

Alternative 2: Exclude the standby well in apportioning population to the system.

Each of the three water supply units provides 33 percent.

Because none of the 3 provides more than 40 percent of the total water supply, assign one-third of the population ($1/3 \times 6,000 = 2,000$ people) to each well or intake.

- (1) **Sum the population served by surface water intakes subject to Level II concentrations.**

Level II concentrations factor value = 2,000 (S_1 population)

- (2) **Assign dilution-weighted population values from HRS Table 4-14 to surface water Intake subject to potential contamination (S_2).**

2,000 people served by an intake located along a small river receive a dilution-weighted population value of 2.

Potential contamination factor value = $(1/10)(2) = 0.2$

- (3) **Add the values from Steps (1) and (2) to get the population factor value.**

$2,000 + 0.2 = 2,000.2$

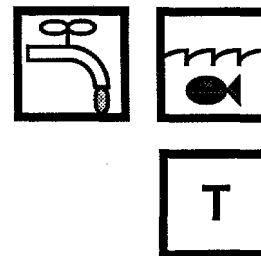
Note: The 2,000 people assigned to the ground water well are not evaluated for the surface water pathway.

Selected Alternative: **Because Alternative 1 results in the higher population factor value, Alternative 1 is used to evaluate the factor.**

TIPS AND REMINDERS

- The annual use criterion applies only to the nearest intake factor evaluation. A standby intake can be used to evaluate population without meeting the annual use criterion, providing it is regularly maintained so that water can be withdrawn.
- Including a standby intake is likely to yield a higher population score if its level of contamination is higher than that of regular intakes within the system (e.g., the standby intake is subject to Level I contamination and the regular supply intakes are subject only to Level II or potential contamination).
- If only potential contamination is scored, including a standby intake is likely to yield a higher population factor score if it is located on a smaller water body than the regular supply intakes or if the blended system includes ground water wells.
- Do not include standby ground water wells when scoring the surface water pathway.
- Use average pumpage for the period in which the standby intake is used, rather than average annual pumpage, when evaluating standby intakes.
- Standby intakes do not have to be included in scoring. Even if one standby intake is included, it is not necessary to include all of them. Include only those standby intakes that will increase the population factor value. The apportioning may be different than for the ground water pathway and may also differ for each watershed evaluated.

SECTION 8.11 RESOURCES



This section provides guidance on scoring the resources factor for the targets factor category of the surface water drinking water threat. The resources factor evaluates the possible loss of surface water use resulting from site-related contamination of the surface water. The resources factor does not evaluate threats to human health, which are considered in the nearest intake and population factors, and in the human food chain threat. Unlike the ground water resources factor, the surface water resources factor does not address commercial aquaculture, which is evaluated in the human food chain threat. HRS section 4.1.2.3.3 discusses the resources factor.

DEFINITIONS

Commercial Food Crops: Crops that are intended to be sold widely, such as in supermarkets, and locally, such as those sold at local produce stands. Crops grown for domestic consumption or for use in a single restaurant are not considered commercial food crops.

Commercial Forage Crops: Crops grown to be sold as food for livestock (it is not necessary to document that these crops were sold only for commercial livestock), and grasslands used for grazing by commercial livestock (including areas technically defined as "pasture/rangeland" by the USDA).

Commercial Livestock: Livestock raised for sale to commercial wholesalers or supermarkets. Livestock raised for private or domestic use is not considered commercial livestock.

Designated for Drinking Water Use: Section 305(a) of the Clean Water Act requires states to prepare a water quality inventory that designates and classifies certain waters for drinking water use. The water can have such a classification even if it is not currently used for or is not currently suitable to be used for drinking water.

Ingredient In Commercial Food Preparation: Surface water used for wholesale food preparation (e.g., a manufacturer that prepares food products to be sold in supermarkets or produce stands). Food prepared in restaurants is not included in this category.

Major or Designated Water Recreation Area: A major water recreation area is an area used by a large number of people for recreational purposes (e.g., swimming or fishing). A designated water recreation area is an area designated and maintained by a government body (e.g. local, state, or Federal) as an area for public recreation.

SCORING THE RESOURCES FACTOR

- (1) **Use the checklist in *Highlight 8-45* to determine if any surface water uses that are assigned resource points apply to the watershed.** Do not use standby intakes to evaluate the resources factor.

The following sources of information on possible surface water uses will help in documenting resource use for a watershed:

- USGS topographic maps and land use data
- USDA county crop records and irrigated acreage data
- Field observations
- Interviews with water company officials
- Public utility trade association online services (e.g., American Water Works Association's WaterNet data base)
- Existing PA/SI reports for the site or nearby sites.
- Correspondence with nearby businesses
- Correspondence with other nearby institutions, such as farms or universities
- EPA's FRDS
- Agricultural extension agents
- Local chambers of commerce
- Federal, state, or regional parks and recreation departments
- State public water supply offices (usually found in state departments of health or environment)
- State water classification and designation maps

(2) **If a resource use is documented, assign a value of 5 to the resources factor for the watershed; otherwise, assign a value of 0.**

HIGHLIGHT 8-45 CHECKLIST FOR THE RESOURCES FACTOR

For the watershed being evaluated:

(1)	Is surface water used to irrigate five or more acres of commercial food crops or commercial forage crops?	Yes	No
(2)	Is surface water used to water commercial livestock?	Yes	No
(3)	Is surface water used as an ingredient in commercial food preparation?	Yes	No
(4)	Is surface water used as, or used to supply, a major or designated water recreation area, excluding drinking water use?	Yes	No
(5)	If surface water is not used for drinking water within the TDL, is any portion of the surface water designated by the state for drinking water use under Section 305(a) of the Clean Water Act, as amended, or is any portion usable for drinking purposes?	Yes	No

If the answer to any of the above questions is "yes", assign a resources factor value of 5. If the answer to all questions is "no", assign a resources factor value of 0.

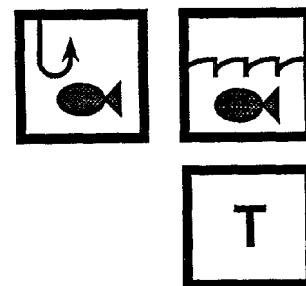
TIPS AND REMINDERS

- Because the surface water resources factor receives only 5 target points, this factor generally has little impact unless the site score is near the cutoff score.
- A surface water body used for drinking water and other specified resource use (e.g., irrigation) can be assigned target points for both the population and resources target values.
- A major or designated recreation area may also overlap with a sensitive environment and/or a fishery. Such an area may receive points for resources and sensitive environments and fisheries, if each type of use is documented.
- Resources for the surface water pathway are evaluated anywhere within the TDL for the watershed.

SECTION 8.12

ACTUAL HUMAN FOOD

CHAIN CONTAMINATION



A fishery (or portion of a fishery) is subject to actual contamination if specific criteria demonstrate the fishery has been contaminated by hazardous substances attributable to the site. Fisheries subject to actual contamination are weighted more heavily than fisheries subject to potential contamination in the human food chain target evaluation. In many cases, documenting actual human food chain contamination results in a site score above the HRS cutoff.

This section provides guidance on identifying and scoring fisheries (or portions of fisheries) subject to actual human food chain contamination. When a fishery is present, data used to document an observed release to surface water may also satisfy the criteria for establishing actual human food chain contamination. This section also provides guidance on determining whether fisheries (or portions of fisheries) subject to actual contamination are exposed to Level I or Level II concentrations, and scoring sites with actually contaminated fisheries.

RELEVANT HRS SECTIONS

Section 2.3	Likelihood of release
Section 2.5	Targets
Section 2.5.1	Determination of level of actual contamination at a sampling location
Section 2.5.2	Comparison to benchmarks
Section 4.1.1.2	Target distance limit
Section 4.1.2.1.1	Observed release
Section 4.1.3.2.1.3	Bioaccumulation potential
Section 4.1.3.3	Human food chain threat - targets
Section 4.1.3.3.1	Food chain individual
Section 4.1.3.3.2	Population
Section 4.1.3.3.2.1	Level I concentrations
Section 4.1.3.3.2.2	Level II concentrations

DEFINITIONS

Actual Contamination for the Human Food Chain Threat: Any portion of a fishery is subject to actual contamination if a hazardous substance with a BPFV of 500 or greater meets the criteria for an observed release; a fishery is closed, and a hazardous substance for which the fishery was closed is documented in an observed release; or a hazardous substance is present in a tissue sample from an essentially sessile, benthic food chain organism at a level that meets the criteria for an observed release.

Aquatic Human Food Chain Organism: Aquatic species directly consumed by humans, including certain finfish, shellfish, crustaceans, amphibians, and amphibious reptiles.

Benthic Organisms: Organisms that live on or at the bottom (i.e., not in the water column) of water bodies for most of their adult life cycle, such as clams, lobsters, and crayfish.

Bioaccumulation Potential Factor Value (BPFV): BPFV is a measure based on a hierarchy of three types of data: bioconcentration factor; n-octanol-water partition coefficient (K_{ow}); and water solubility. BPFV reflects the tendency for a substance to accumulate in the tissue of an aquatic organism – the greater the BPFV, the greater the relative tendency of a substance to accumulate. BPFVs for commonly encountered hazardous substances are listed in SCDM.

Closed Fishery: A fishery closed or restricted by a government entity. Such closure prohibits fishing for commercial, recreational, or subsistence purposes. To be evaluated for the HRS, closure must be due to hazardous substances released from sources at the site.

Essentially Sessile Benthic Organisms: Organisms that essentially stay at or near a localized spot in a water body during the adult stage of their life cycle (e.g., barnacles, oysters, mussels, sponges, and stalked diatoms). These organisms may not live on the bottom, but must not live suspended in the water column. They may be attached to rocks, pilings, or submerged banks at or near the surface. Samples from these organisms can be used in the HRS for two purposes:

- (1) To establish an observed release (use any essential sessile benthic organism); and
- (2) To establish actual contamination and the level of contamination (use only human food chain organisms).

Fishery: Any area of a surface water body from which human food chain organisms are taken or could be taken for human consumption on a commercial, recreational, or subsistence basis. Food chain organisms include fish, shellfish, crustaceans, amphibians, and amphibious reptiles. Fisheries are delineated by changes in dilution weights, level of contamination, or annual production. To establish a fishery, document that human food chain organisms are present and that people fish in the surface water body.

Level I Concentrations for the Human Food Chain Threat: Level I concentrations are established in tissue samples from aquatic human food chain organisms in which the concentration of a hazardous substance that meets the criteria for an observed release is at or above its specific health-based benchmark. The tissue sample must also be taken from within the boundaries of the area of actual contamination. Aqueous and sediment sample results cannot be used to establish Level I concentrations for this threat. Benchmarks for the human food chain threat include FDAAL for fish or shellfish and screening concentrations for cancer and chronic noncancer effects.

Level II Concentrations for the Human Food Chain Threat: Level II concentrations are established in samples in which the concentration of at least one hazardous substance meets the criteria for an observed release, but the conditions for Level I concentrations are not met. In addition, Level II is assigned for observed releases established by direct observation.

Sessile Organisms: Organisms permanently attached to some substrate for most of their life cycle, such as sponges, barnacles, stalked diatoms, and oysters.

DOCUMENTING PRESENCE OF A FISHERY

Before evaluating the level of contamination, document that the surface water body under evaluation is a fishery. Collect evidence to document both of the following:

- Human food chain organisms are present in the surface water body; and
- Some attempt has been made to catch those human food chain organisms.

Useful sources of information include state and local fish and wildlife agencies, local bait and tackle shops, visual observation during the SI of individuals fishing or of past fishery activity (e.g., fishing lines and hooks left behind near the surface water body).

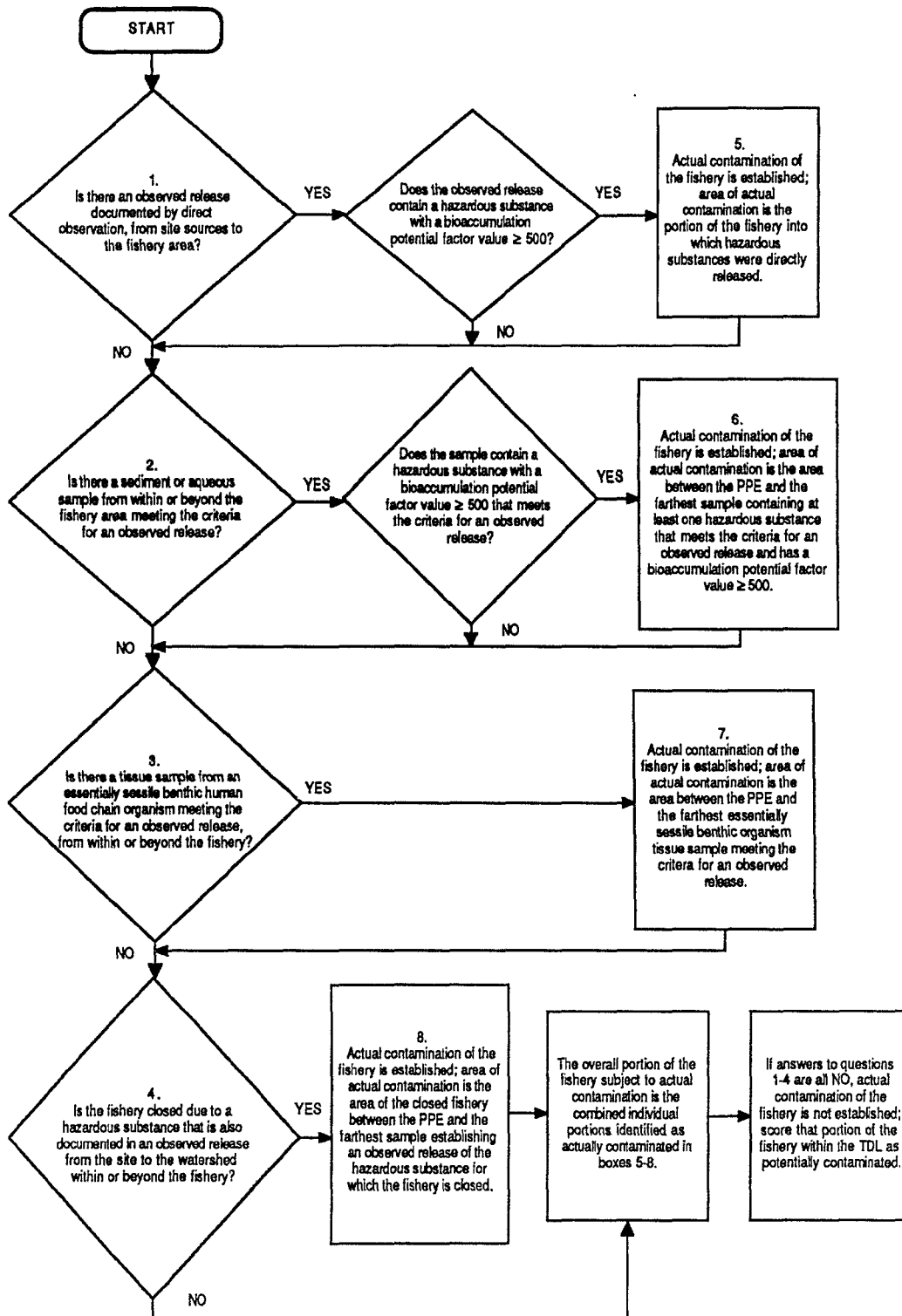
ESTABLISHING ACTUAL CONTAMINATION OF A FISHERY

The following steps describe the procedures used to establish actual contamination. Because a necessary criterion for establishing actual contamination is documentation of an observed release, the first five steps are designed to document an observed release by chemical analysis. To establish an observed release by direct observation, follow the procedures in the first step. To establish an observed release by chemical analysis, use Steps (2) to (5). These steps should be repeated for each hazardous substance attributable to the site detected in applicable surface water samples. **Highlight 8-46** summarizes procedures for determining whether fisheries are actually contaminated.

- (1) **Establish an observed release by direct observation.** An observed release can be demonstrated if at least one of the following criteria is met:
 - A material that is documented to contain one or more site-related hazardous substances has been directly deposited into or has been seen entering surface water through migration (e.g., leachate, outfall, effluent);
 - A source (or a portion of a source) has been flooded and at that time hazardous substances in the source were in contact with flood waters (e.g., a wet surface impoundment inundated by flood waters); or
 - Evidence supporting the inference of a release of hazardous substances from the site exists and adverse effects associated with the inferred release can be demonstrated (e.g., a significant fish kill occurred after electroplating wastes containing heavy metals were inadvertently spilled in a work area immediately adjacent to surface water).
- (2) **Compile analytical results indicating that a hazardous substance has been detected in surface water samples.** To establish an observed release by chemical analysis to surface water and/or actual fishery contamination, review sediment, aqueous, and tissue sample data. To be eligible for establishing an observed release, tissue samples must be from essentially sessile benthic organisms (e.g., oysters) (see **Highlight 8-47**).
- (3) **Determine the background level for the hazardous substance.** Determining the background level usually requires analytical results from one or more appropriate sample locations for each type of sample being evaluated (e.g., aqueous, sediment), particularly for substances that could be naturally occurring, ubiquitous, or attributable to other sites. A background level of 0 generally can be assumed for a substance that is not naturally occurring, ubiquitous, or attributable to other sites.
- (4) **Determine whether the concentration of the hazardous substance is significantly above background.** Detailed guidance for making this determination is found in Section 5.1, particularly **Highlight 5-2**.
- (5) **Determine whether the hazardous substance can be attributed to the site.** Sampling results or records (e.g., manifests, permits) indicating the presence of the hazardous substance in a source or sources at the site are one useful type of documentation. Information that the hazardous substance was used at the facility also may be acceptable. See Chapter 5 for additional guidance on attribution, including attribution of degradation products.

HIGHLIGHT 8-46

FLOWCHART FOR IDENTIFYING CONTAMINATED FISHERIES



HIGHLIGHT 8-47

USE OF TISSUE SAMPLES FROM AQUATIC ORGANISMS

For the human food chain threat, tissue samples can be used to establish actual contamination and are required to establish Level I concentrations. Aquatic organisms can be divided into two groups: (1) essentially sessile benthic organisms and (2) organisms likely to spend extended periods of time within a fishery that are not essentially sessile benthic organisms. Only tissue samples from essentially sessile benthic human food chain organisms can be used to establish both an observed release to surface water and actual human food chain contamination. Tissue samples from other aquatic organisms, in certain circumstances, can be used to establish Level I contamination, but only within an area of actual contamination established with other samples (or by direct observation). Evaluate tissue samples, as follows.

- Compare samples from similar organisms (e.g., similar age) of the same species.
- Compare samples of the same tissue type (e.g., liver samples should be compared with liver samples, roe samples with roe samples).
- The hierarchy of preference for sample types is: edible tissues (e.g., fillets for most finfish), edible tissues with associated tissues attached or only partially removed, whole-body samples, and samples of other specific tissues or organs. Use less desirable sample types only when other data are not available.
- Verify the sample locations and note possible influences on sample data such as intervening tributaries.

The following table provides examples of different tissue samples used for HRS scoring and the function the samples serve when evaluating the human food chain threat.

Sample Type	Sample Use	Example Organisms
Essentially Sessile Benthic Organisms	Used to establish an observed release.	Barnacles Stalked Diatoms Sponges
Essentially Sessile Benthic Human Food Chain Organisms	Used to establish an observed release and actual contamination.	Mussels Oysters
Organisms Likely to Spend Extended Periods of Time Within the Boundaries of Actual Food Chain Contamination but not Essentially Sessile Benthic Organisms	Can be used to raise Level II concentrations to Level I concentrations but cannot be used to establish an observed release or actual contamination.	Non-sessile Benthic: Lobsters Crabs Snails Shrimp Crayfish Scallops Finfish: Pike Bass Tuna Flounder Trout Salmon Other Food Chain Organisms: Frogs Salamanders Squid

- (6) **Establish actual contamination.** To establish actual contamination of a fishery (or portion of a fishery), the fishery must be within the area bounded by an observed release and at least one of the following criteria must be met:
- A hazardous substance with a BPFV of 500 or greater is present in an observed release sample (aqueous or sediment), or by direct observation;
 - For a closed fishery, a hazardous substance for which it was closed must be documented in an observed release from the site. The hazardous substance need not have a BPFV of 500 or greater to establish actual contamination; or
 - A hazardous substance attributable to the site is present in tissue samples from an essentially sessile benthic human food chain organism at levels that meet the criteria for an observed release. The hazardous substance need not have a BPFV of 500 or greater to establish actual contamination.

Only fisheries (or portions of fisheries) located within the boundaries of actual contamination are evaluated as subject to actual contamination. A fishery (or portion of a fishery) may be located within the boundaries of an observed release to surface water but not be subject to actual contamination. For example, assume asbestos contamination was detected in aqueous and sediment samples at concentrations demonstrating an observed release to surface water. The BPFV for asbestos is less than 500. In the absence of other data, the fishery must be evaluated as subject to potential contamination because no substance with a BPFV greater than 500 has been documented in an observed release.

DETERMINING THE LEVEL OF ACTUAL CONTAMINATION

A fishery (or portion of a fishery) is subject to actual contamination if it is located within the boundaries of an observed release and the other criteria specified in Step (6) above, are met. The following procedures outline how to determine if a fishery for which actual contamination has been established should be evaluated for Level I or Level II concentrations. **Highlight 8-48** describes sample types and criteria used to establish Level I and Level II concentrations.

- (1) **If actual contamination is established based only on aqueous samples, sediment samples, or direct observation, score the portion of the fishery within the area of actual contamination as Level II concentrations.**
- (2) **If tissue samples from a human food chain organism are available, determine if such samples are eligible to be used to establish Level I, as follows.**
- For essentially sessile benthic human food chain organisms, both of these criteria must be met:
 - One or more hazardous substances in the tissue samples must establish an observed release to surface water from the site; and
 - The tissue samples must be from an aquatic species typically consumed by people.
 - For non-sessile or non-benthic human food chain organisms, all three of the following criteria must be met:
 - The species sampled spends extended periods of time within the boundary of actual fishery contamination; and

- Actual contamination is established through aqueous or sediment samples or from tissue samples from an essentially sessile benthic organism; and
- The hazardous substances found in tissues and compared to benchmarks are also present in the aqueous sample used to establish actual human food chain contamination.

- (3) **For samples that meet the criteria in Step (2), compare the concentration of each hazardous substance with its health-based benchmarks for the human food chain threat.** If the hazardous substance concentration equals or exceeds its lowest applicable benchmark concentration, consider the sampling location subject to Level I concentrations for the human food chain threat. See **Highlight 8-49**. If more than one hazardous substance meets the criteria in Step (2), but no single hazardous substance establishes Level I, continue to Step (4).

HIGHLIGHT 8-48
SAMPLES AND CRITERIA FOR LEVEL I AND LEVEL II CONCENTRATIONS
IN THE HUMAN FOOD CHAIN THREAT

Sample Type	Usefulness for Human Food Chain Threat
Level I	
Surface Water/Sediment	Cannot be used to establish Level I concentrations.
Tissue From Essentially Sessile Benthic Human Food Chain Organisms (e.g., clams)	Hazardous substance concentrations must equal or exceed lowest human food chain benchmark concentration (or indices I or J must equal or exceed 1); must also meet criteria for an observed release.
Tissue From Non-Sessile or Non-Benthic Human Food Chain Organisms (e.g., finfish, crabs) ^a	Hazardous substance concentrations must equal or exceed lowest human food chain benchmark concentrations (or indices for I or J must equal or exceed 1).
Level II	
Surface Water/Sediment	A hazardous substance with a BPFV of 500 or greater must meet criteria for an observed release.
Tissue From Essentially Sessile Benthic Human Food Chain Organisms (e.g., clams)	Hazardous substance concentrations less than lowest HFC benchmark concentrations (or indices for I and J are less than 1); must also meet criteria for an observed release
Tissue From Non-Sessile or Non-Benthic Human Food Chain Organisms (e.g., finfish, crabs)	Cannot be used to establish actual contamination and therefore cannot be used to establish Level II (i.e., Level II must already be established).

^a Concentrations of hazardous substances must be measured in a tissue sample from a non-sessile or non-benthic human food chain organism taken from within the boundary of actual food chain contamination and from a species that spends extended periods of time within this boundary. The specific hazardous substance which is compared to its benchmark must also be present in an aqueous, sediment or benthic sample that establishes actual food chain contamination for the fishery.

HIGHLIGHT 8-49

BENCHMARKS FOR THE HUMAN FOOD CHAIN THREAT

- FDAALs for fish or shellfish
- Screening concentration corresponding to oral RfD
- Screening concentrations corresponding to oral 1×10^6 cancer risk level.

- (4) **Calculate the I and J indices based on all hazardous substances that meet the criteria for actual contamination.** Make two lists of hazardous substances that meet the criteria in Step (2) above: hazardous substances with screening concentrations for cancer risk; and hazardous substances with screening concentrations for noncancer effects. Each hazardous substance may be on one, neither, or both of the lists. If more than one tissue sample has been taken and these samples are comparable (e.g., taken in the same time frame, collected using the same field techniques, analyzed by the same methods), select the highest concentration for each hazardous substance to use in the calculations below.

- Calculate the I index for all hazardous substances in the tissue sample that meet the criteria in Step (2) above, and that have screening concentrations for cancer risk using the following equation:

$$I = \sum_{i=1}^n \frac{C_i}{SC_i}$$

where: C_i = concentration of substance j in tissue sample
 SC_i = screening concentration for cancer risk corresponding to 10^6 individual cancer risk for oral exposure for hazardous substance i ; and
 n = number of hazardous substances that meet the criteria in Step (2) above and have a SC available.

- Calculate the J index for all hazardous substances that meet criteria in Step (2) above and that have oral screening concentrations for noncancer effects using the following equation:

$$J = \sum_{j=1}^m \frac{C_j}{CR_j}$$

where: C_j = concentration of substance j in tissue sample
 CR_j = screening concentration for noncancer effects corresponding to the reference dose for oral exposure for hazardous substance j ; and
 m = number of hazardous substances in sample that meet the criteria in Step (2) above and for which a CR is available.

- If either the I or J index is greater than or equals 1, consider the sample location to be subject to Level I concentrations for the human food chain threat. If both the I and J indices are less than 1, consider the sample location to be subject to Level II.

SCORING SITES WITH ACTUAL CONTAMINATION

Establishing actual human food chain contamination can affect the scoring of three HRS factors: food chain individual, human food chain population, and hazardous waste quantity. **Highlight 8-50** summarizes the scoring for these three factor values in relation to various levels of contamination.

HIGHLIGHT 8-50
COMPARISON OF SCORING LEVEL I, LEVEL II, AND
POTENTIAL CONTAMINATION

Level of Contamination	Food Chain Individual Factor Value	Population Factor Value	Minimum Surface Water HWQ Factor Value ^a
Level I Concentrations	50	10 x Level I Human Food Chain Population Value	100
Level II Concentrations	45	1 x Level II Human Food Chain Population Value	100
Potential Food Chain Contamination	0 to 20 -- depends on dilution weight and whether there is an observed release	0.1 x Potential Human Food Chain Population Value x Dilution Weight	10

^a Only applies if Tier A is not adequately determined.

(1) Assign a Food Chain Individual Factor Value.

- If any fishery (or portion of a fishery) is subject to actual contamination, base the value on the highest level of contamination present. Assign a value of 50 if Level I concentrations are present, or a value of 45 if only Level II concentrations exist.
- If no fishery is subject to actual contamination, but there is an observed release of a hazardous substance having a BCFV of 500 or greater to the watershed, assign a value of 20.
- If there is no observed release of a hazardous substance having a BCFV of 500 or greater, assign a value by multiplying the highest applicable dilution weight by 20 and round to the nearest integer.

(2) Calculate Human Food Chain Population Factor Value (see Section 8.13). Calculate the human food chain population factor value for all fisheries (or portions of fisheries) being evaluated as follows:

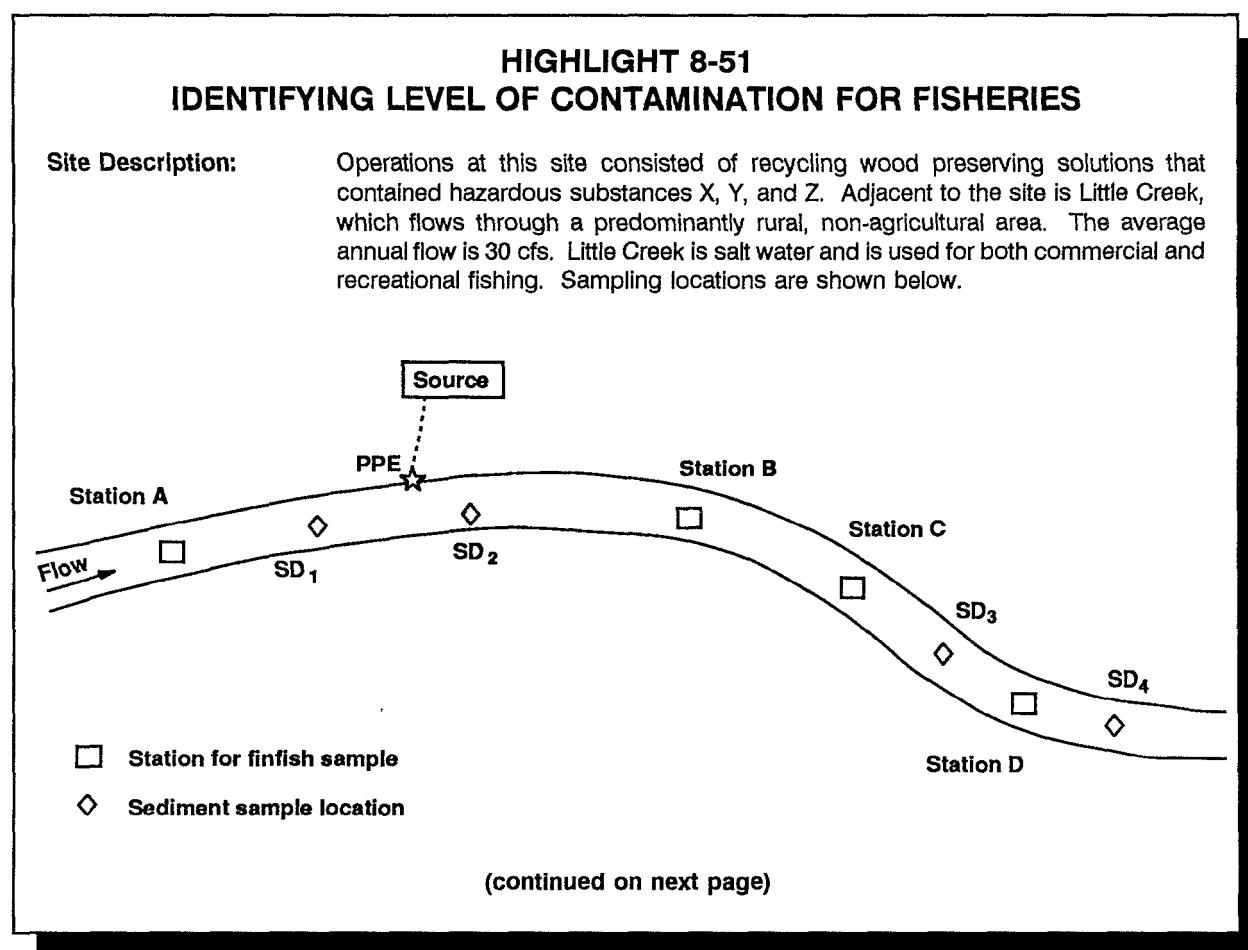
- For the Level I concentrations factor value, sum HRS-assigned human food chain population values (HRS Table 4-18) and multiply by 10. If the product is less than 1, do not round to nearest integer; if the product is greater than or equal to 1, round to the nearest integer.
- For the Level II concentrations factor value, sum the HRS-assigned human food chain population values (HRS Table 4-18) and multiply by 1. If the product is less than 1, do not round to nearest integer; if the product is greater than or equal to 1, round to the nearest integer.
- For the potential human food chain factor value, multiply the HRS-assigned human food chain population value (HRS Table 4-18) for each fishery by the surface water body dilution weight (HRS Table 4-13), sum the values, and multiply by 0.1. If the

product is less than 1, do not round to nearest integer; if the product is greater than or equal to 1, round to the nearest integer.

- Sum the values for the Level I concentrations, Level II concentrations, and potential human food chain factors. Do not round the sum to the nearest integer. Assign the sum as the population factor value for the watershed.

- (3) **Review the Hazardous Waste Quantity Factor Value.** If the hazardous waste quantity evaluation is not based on complete hazardous constituent quantity data (i.e., Tier A) and if Level I or Level II concentrations are demonstrated for any of the three surface water threats, the minimum factor value for hazardous waste quantity is 100 for all surface water threats.

Highlight 8-51 provides a site-specific example for determining whether a fishery (or portion of a fishery) is subject to Level I concentrations, Level II concentrations, or potential contamination.



HIGHLIGHT 8-51 (continued) IDENTIFYING LEVEL OF CONTAMINATION FOR FISHERIES

Compound	Sediment Sampling Data by Location ^a (ppm)		Finfish Sampling Data by Location ^b (ppm)			Substance-Specific Screening Concentrations	
	SD ₂	SD ₃	Station B	Station C	Station D	RfD SC (ppm)	Cancer Risk SC
X	440	18	26	3	7	48	N/A
Y	25	<SQL	<SQL	<SQL	<SQL	6.5	N/A
Z	50	<SQL	2	1	<SQL	1.3	7.2x10 ⁻⁴

^aConcentrations of compounds X, Y, and Z were below SQLs at sample locations SD₁ and SD₄.

^bConcentrations of compounds X, Y, and Z were below SQLs in the finfish sample collected at Station A.

Area of

Contamination: Sample results indicate a zone of actual contamination between the PPE and SD₃. The SD₂ sample location establishes actual contamination based on levels of substances X, Y, and Z (all of which have BPFVs \$500) compared to levels in SD₁. The portion of the fishery between Samples SD₂ and SD₃ is also actually contaminated based on levels of X in SD₃. Station B and C sample results indicate the presence of X in finfish samples, but levels are below the benchmark, so results do not support Level I concentration.

Level of

Contamination: Because sediment samples cannot be used to establish concentrations in the human food chain threat, the finfish samples are the only possibility for establishing Level I.

- Although the substance Z concentration detected at Station C is above the applicable benchmark, it cannot be used to establish Level I concentration because this finfish sampling location is beyond the boundary of actual contamination for substance Z (e.g., substance Z concentrations from finfish samples are not applicable beyond SD₂).
- Similarly, substance X detected in finfish at Station D cannot be used because the boundary for actual contamination based on substance X ends at SD₃.
- In this sample, Level I cannot be demonstrated by calculating I and J indices based on finfish sample results.

Conclusion: Therefore, the portion of the fishery between the PPE and SD₃ is evaluated based on Level II concentrations. The portion of the fishery between Sample SD₃ and the TDL is subject to potential human food chain contamination.

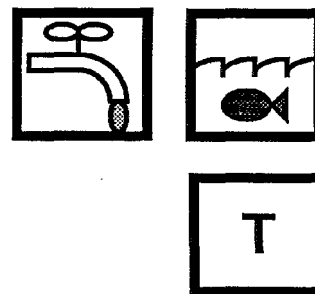
TIPS AND REMINDERS

- In general, hazardous substance concentrations from edible tissue samples (i.e., fillets for most finfish, soft tissue for mussels and oysters) are preferred for evaluating the level of actual contamination.
- When evaluating fisheries in brackish water, use the higher BPFV (i.e., salt water or fresh water value) when determining actual contamination.
- Use only BPFVs associated with those substances that establish an observed release to surface water to determine if actual human food chain contamination exists.
- If an observed release is based on chemical analysis, analytical results for comparing release to background must be from the same medium (e.g., sediment samples should be compared with sediment samples; aqueous samples should be compared with aqueous samples).
- An observed release is a necessary but not sufficient condition for establishing actual human food chain contamination.
- Not all aquatic human food chain species can be used to establish an observed release to surface water; however, all aquatic human food chain species can be used to establish Level I contamination if an observed release is already established (by use of other sample types).
- Finfish tissue samples (and samples from any non-sessile or non-benthic organisms) cannot establish an observed release or actual contamination by themselves.
- When documenting actual contamination of a closed fishery, a BCFV of 500 or greater is not required if the substance being used to establish the observed release (and actual contamination) is one for which the fishery was closed.
- Consider analytical results from tissue samples from non-benthic or non-sessile human food chain organisms only if they are collected in an area of actual contamination.
- Assign a minimum hazardous waste quantity factor value of 100 for the human food chain threat if a fishery is subject to actual contamination and Tier A is not adequately determined.
- Direct observation cannot be used to establish Level I concentrations.
- Because no aqueous or sediment benchmarks exist for evaluation of the food chain threat, surface water and sediment samples cannot be used to establish Level I concentrations.
- Tissue samples from non-sessile and non-benthic human food chain organisms can only be used to establish Level I concentrations in an area of actual human food chain contamination established by other samples.
- When using tissue sample results from essentially sessile benthic human food chain organisms to evaluate Level I or Level II concentrations, establish background levels using similar organisms of the same species.

SECTION 8.13

HUMAN FOOD CHAIN

PRODUCTION



This section provides guidance on estimating human food chain production for fisheries within the surface water TDL. Human food chain production can be estimated based on production data or stocking rate data. In order to assign a human food chain population value from HRS Table 4-18, estimates must be expressed in pounds of edible species or organisms harvested annually from a portion of the fishery subject to a specific level of contamination – Level I concentrations, Level II concentrations, and potential human food chain contamination. Guidelines are provided to determine when it is necessary and efficient to score the human food chain population factor.

RELEVANT HRS SECTIONS

Section 4.1.3.3	Human food chain threat - targets
Section 4.1.3.3.2	Population
Section 4.1.3.3.2.1	Level I concentrations
Section 4.1.3.3.2.2	Level II concentrations
Section 4.1.3.3.2.3	Potential human food chain contamination

DEFINITIONS

Actual Contamination for the Human Food Chain Threat: Any portion of a fishery is subject to actual contamination if a hazardous substance with a BPFV of 500 or greater meets the criteria for an observed release; a fishery is closed, and a hazardous substance for which the fishery was closed is documented in an observed release; or a hazardous substance is present in a tissue sample from an essentially sessile, benthic food chain organism at a level that meets the criteria for an observed release.

Actual Human Food Chain Organism: Aquatic species directly consumed by humans, including certain finfish, shellfish, crustaceans, amphibians, and amphibious reptiles.

Fishery: Any area of a surface water body from which human food chain organisms are taken or could be taken for human consumption on a commercial, recreational, or subsistence basis. Food chain organisms include fish, shellfish, crustaceans, amphibians, and amphibious reptiles. Fisheries are delineated by changes in dilution weights, level of contamination, or annual production. To establish a fishery, document that human food chain organisms are present and that people fish in the surface water body.

Production: Estimate of annual pounds of human food chain organisms harvested for human consumption through all activities, including commercial, recreational, and subsistence fishing. Often times, production can be determined from harvest, catch, or commercial landings data, if the reported data refer only to human food chain organisms.

Productivity: Common surrogate for yield data, often expressed as pounds of human food chain organisms present per acre per year. Productivity data are not equivalent to production estimates and generally are not used for HRS purposes.

Standing Crop: Biomass of all human food chain organisms in a given area of a surface water body at one time. Standing crop data are not equivalent to production estimates and generally are not used for HRS purposes.

Stocking Rate: Number of human food chain organisms (or pounds of human food chain organisms) per unit time introduced into a given surface water body by local, state, or Federal fishery agencies.

Yield: Maximum amount of human food chain organisms that could be caught by commercial, recreational, and subsistence fishermen from a given water body. Yield is expressed as weight of human food chain organisms present per unit area (or volume) per unit time. Yield data are not equivalent to production estimates and generally are not used for HRS purposes.

ESTIMATING THE HUMAN FOOD CHAIN POPULATION FACTOR

This section provides lookup tables to determine the annual production required to assign a certain number of target points to the human food chain population factor. If a preliminary estimate of the likely range of annual production (in pounds of human food chain organisms) can be made, these tables assist in determining the range of target points likely to be assigned after fully documenting a food chain production value.

- (1) **Evaluate actual contamination.** If there is actual contamination within a portion of the fishery, the human food chain individual will score significantly (i.e., at least 45 points). Therefore, pursue production data not readily available only when production is expected to be significant (e.g., greater than 1,000 pounds/year).
 - See **Highlight B-52** to determine the level of production that would be needed to assign the indicated number of points to the human food chain population factor under actual contamination. A higher score may result when more than one fishery or several levels of contamination are present within the TDL.
- (2) **Evaluate potential contamination.** Potential human food chain contamination only contributes significantly to the human food chain threat target score when:
 - High production in pounds per year is documented within the TDL; and
 - A water body with a large surface water dilution weight (e.g., minimal and small to moderate streams having average annual flows less than or equal to 100 cfs, closed lakes, or lakes with low flows entering or leaving) is being evaluated.

In many circumstances, only one of these conditions will be present. For example, oceans and Great Lakes generally have large production levels, but they also have relatively small dilution weights (e.g., 0.0001 or less), greatly reducing the target points. For a fishery with dilution weight of 0.0001 subject to potential contamination to receive more than 3 target points, annual production of more than 10^8 pounds would need to be documented.

- See **Highlight 8-53** to determine the level of production that would be needed to assign the indicated number of points to the human food chain population factor under potential contamination. The highlight focuses on a single fishery evaluated under potential contamination. A higher score may result when more than one fishery or several levels of contamination are present within the TDL. However, the score is

HIGHLIGHT 8-52
VALUES FOR HUMAN FOOD CHAIN POPULATION FACTOR
GIVEN ACTUAL CONTAMINATION IN A FISHERY

Factor Values for Human Food Chain Population ^a	Annual Production in Pounds Required - Level I	Annual Production in Pounds Required - Level II
0.03	Not Applicable	>0 to 10 ²
0.30	>0 to 10 ²	>10 ² to 10 ³
3.00	>10 ² to 10 ³	>10 ³ to 10 ⁴
30.00	>10 ³ to 10 ⁴	Not Applicable
31.00	Not Applicable	>10 ⁴ to 10 ⁵
310.00	>10 ⁴ to 10 ⁵	>10 ⁵ to 10 ⁶
3,100.00	>10 ⁵ to 10 ⁶	>10 ⁶ to 10 ⁷
31,000.00	>10 ⁶ to 10 ⁷	>10 ⁷ to 10 ⁸
310,000.00	>10 ⁷ to 10 ⁸	>10 ⁸ to 10 ⁹
3,100,000.00	>10 ⁸ to 10 ⁹	>10 ⁹
31,000,000.00	>10 ⁹	Not Applicable

^aAssumes a single fishery and a single level of actual contamination. Note that these values do not represent assigned values from Table 4-18; they represent the factor value for Level I or Level II which is the assigned value multiplied by 10 for Level I, or the assigned value multiplied by 1 for Level II.

not likely to be significantly higher if all fisheries are evaluated based on potential contamination.

For many sites, expending extensive effort to evaluate fisheries subject to potential contamination when productivity data are not readily available may not be the most efficient use of resources.

- (3) **Use the guidance below to document production.** If the above assessment indicates that it is efficient to document human food chain production, the subsections below present the generally preferred type of documentation first, followed by alternative approaches.

- Document production using site-specific data. Apportion that data to include only surface water bodies within the fishery being evaluated, if necessary.
- Estimate production using surrogate data (e.g., estimates of production from nearby fisheries with similar characteristics).
- If specific production data are not available and a reasonable estimate of production cannot be made, use a production estimate of greater than 0 pounds per year to evaluate the human food chain population factor.

HIGHLIGHT 8-53
VALUES FOR HUMAN FOOD CHAIN POPULATION FACTOR GIVEN
POTENTIAL CONTAMINATION IN A FISHERY

Factor Values for Human Food Chain Population ^a	Dilution Weights	Annual Production in Pounds Required
0.02	0.000005	$>10^7 - 10^8$
0.03	1 0.1 0.01 0.001 0.0001 0.00001	$>10^2 - 10^3$ $>10^3 - 10^4$ $>10^4 - 10^5$ $>10^5 - 10^6$ $>10^6 - 10^7$ $>10^7 - 10^8$
0.16	0.000005	$>10^8 - 10^9$
0.31	1 0.1 0.01 0.001 0.0001 0.00001	$>10^3 - 10^4$ $>10^4 - 10^5$ $>10^5 - 10^6$ $>10^6 - 10^7$ $>10^7 - 10^8$ $>10^8 - 10^9$
1.6	0.000005	$>10^9$
3.1	1 0.1 0.01 0.001 0.0001 0.00001	$>10^4 - 10^5$ $>10^5 - 10^6$ $>10^6 - 10^7$ $>10^7 - 10^8$ $>10^8 - 10^9$ $>10^9$
31	1 0.1 0.01 0.001 0.0001	$>10^5 - 10^6$ $>10^6 - 10^7$ $>10^7 - 10^8$ $>10^8 - 10^9$ $>10^9$
310	1 0.1 0.01 0.001	$>10^6 - 10^7$ $>10^7 - 10^8$ $>10^8 - 10^9$ $>10^9$
3,100	1 0.1 0.01	$>10^7 - 10^8$ $>10^8 - 10^9$ $>10^9$
31,000	1 0.1	$>10^8 - 10^9$ $>10^9$
310,000	1	$>10^9$

^aAssumes a single fishery and a single level of potential contamination. Note that the dilution weight of 0.5 is not used for the population factor. Note that these values do not represent assigned values from Table 4-18; they represent the factor value for potential contamination which is the assigned value multiplied by the applicable surface water body dilution weight multiplied by 0.1.

DETERMINING PRODUCTION USING SITE-SPECIFIC DATA

- (1) **Collect available data.** Collect data on fishery production within the TDL. General data sources are listed in **Highlight 8-54**. Additional information on the types of data typically available from NMFS is detailed in **Highlight 8-55**.
- Confirm that the data collected represents the fish biomass removed from the water body that is used for human consumption. In heavily fished areas, production data (commercial, recreational, and/or subsistence) needed for evaluating population often will be available.
 - Review units associated with production data. If available production data are reported in numbers or pounds harvested per hour, attempt to convert these into pounds harvested per year by using estimates of average weight per organism and/or total number of hours the water body is fished per year.
 - Select data from an appropriate time frame. Depending on the records available, annual production may be best represented by an average of data from several years. However, if data are available for only a few non-consecutive years, (e.g., 1967 and 1985), it may be appropriate to use only the more recent production.
 - Avoid relying on data sources that do not represent a reasonable estimate of annual production from a specific surface water body.
 - Creel surveys of recreational and subsistence fishing may be available where fishing is substantial and, therefore, likely to be studied by state agencies involved in managing fishery resources. The creel survey is aimed at obtaining broad information on fishing trends such as kinds of fishing, amount of time spent fishing, species and size of fish caught. Because creel surveys are not performed routinely, they are frequently outdated.
 - Local fish consumption rates are generally not relevant because it is the amount of fish consumed from a specific water body that is of interest, not the total amount of fish consumed by individuals in the vicinity of the site.
 - If the fishery management technique has changed (e.g., a stream is no longer stocked by the state), production data from earlier time periods may not be representative.
 - If conflicting production estimates are generated from different sources, select the most defensible production data.
- (2) **Apportion production data.** If actual annual production data are available for the TDL, but include production for a portion of the surface water body not within the fishery being evaluated, apportion data to determine production within the TDL. Multiply the total production for the fishery by the ratio of the area of fishery being evaluated (or the length of coastline) to the total area of the fishery (or length of coastline) for which production data were obtained. There are several circumstances where apportioning may be necessary:
- Production data are given for a stretch of river, only a portion of which is within the TDL. See **Highlight 8-56**.
 - Production data are available for a NMFS distance category (e.g., 3 to 12 miles offshore), and the fishery being evaluated does not extend the whole distance category (e.g., extends to 7 miles offshore). See **Highlight 8-57**.

HIGHLIGHT 8-54

SOURCES OF FISHERY PRODUCTION DATA

Sources of information for production data for fresh water and marine habitats include:

- Literature searches (e.g., published reports) from FWRS. The FWRS receives materials regarding fresh water habitats from Federal, state, and private sources, including: Federal Aid in Fish and Wildlife Restoration Program; Anadromous Sport Fish Conservation Program; Cooperative Fish and Wildlife Units; State Game and Fish Agencies; and Endangered Species Grants Program;
- NMFS, NOAA, U.S. Department of Commerce;
- Dingell-Johnson State Fish Chiefs and their staffs—these personnel coordinate and conduct fishery surveys with funding established under the Federal Aid In Fish and Wildlife Restoration Program;
- State Game and Fish Departments, and Parks and Recreation Departments;
- Local fishery laboratories;
- USFWS; and
- University biology departments which may have field research labs, and may also have specialists in ichthyology or fish management.

Additional sources of Information for production data for fresh water habitats Include:

- Local Office of Bass Unlimited, Trout Unlimited, and other associations;
- SCS (stocks and maintains small impoundments);
- Associations and Commissions (e.g., Sport Fishing Institute);
- River Basin Commissions; and
- National Sport Fishing Federation (NSFF).

Additional sources of Information for production data for marine habitats Include:

- Sea Grant Advisory Service, NOAA; and
- Great Lakes Fish Commission.

HIGHLIGHT 8-55

PRODUCTION DATA TYPICALLY AVAILABLE FROM NMFS

Salt Water Fishery Production - Commercial Fisheries

NMFS maintains and updates annually extensive data bases on commercial and recreational marine production. Commercial data are kept for inland marine areas such as estuaries and bays, as well as for offshore areas. For most coastal states, these data are provided for three distance categories, and as state and country landings. The distance categories are:

- 0 to 3 miles offshore
- 3 to 12 miles offshore
- 12 to 200 miles offshore

Because commercial marine data are often reported as landings (i.e., the numbers or pounds of human food chain organisms brought to a port), data on commercial landings by state and by county do not indicate where the human food chain organisms were actually caught. For example, human food chain organisms caught off the Texas coast might be landed in Louisiana and reported as Louisiana landings. As a result, the geographic location associated with commercial catch data may bear only a tenuous relationship to the locations where the human food chain organisms were harvested or caught. However, commercial landings data for the county (or counties) that a fishery is located adjacent to or contiguous with can generally be used for up to 12 miles offshore. Human food chain organisms landed but not caught in the county are assumed to be offset by human food chain organisms caught in the county but landed elsewhere. Production data for 0 to 3 miles and 3 to 12 miles, therefore, are often representative for a particular area of interest.

Commercial data from NMFS are available for finfish and shellfish. For shellfish, data are available on live weight (i.e., weight with the shell) and on meat weight (i.e., weight without the shell). For commercial shellfish harvest data, use the meat weight and only the proportion of the county commercial production that is used for human consumption to estimate human food chain production. If only the live weight is available, use this data as a reasonable production estimate. NMFS data are sometimes broken down by end-use disposition, for example, human consumption, bait, animal food, and reduction to meal and oils. When possible, determine the proportion of the commercial harvest that is for human consumption.

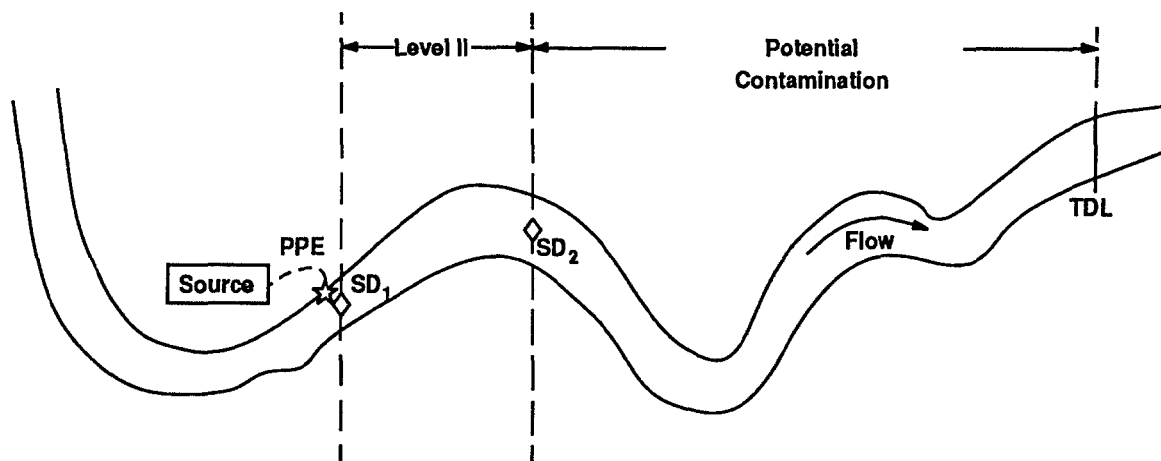
Salt Water Fishery Production - Recreational Fisheries

Data on recreational production are available from NMFS for finfish from 0 to 3 miles offshore. However, these data generally are reported as state or county totals and cannot be broken down by a specific water body (e.g., by a bay or estuary) within the state or within a particular county. Because NMFS does not maintain recreational marine shellfish production data, recreational production data for shellfish are generally not available even though this production can be significant and can equal or exceed the commercial production. Alternate sources for recreational shellfish production are appropriate fish management officials.

Fresh Water Fishery Production - Recreational Fisheries

Data on recreational production are available from NMFS for finfish from fresh waters. These data are reported by state, and generally are not broken down by a specific water body within the state or within a particular county.

HIGHLIGHT 8-56 APPORTIONMENT OF PRODUCTION DATA IN A RIVER



Site Setting: Spearfish Creek is a cold water fishery for both brown and brook trout. The average annual recreational production for the entire length (approximately 35 miles) of Spearfish Creek is 250 pounds based on information provided by the State Department of Game, Fish, and Parks.

Level II Contamination: The fishery in approximately 2 additional miles of Spearfish Creek is subject to Level II concentrations from the site based on Samples SED-01 and SED-02.

$$\frac{2 \text{ miles}}{35 \text{ miles}} = 0.0571 \quad 0.0571 \times 250 \text{ lbs/yr} = 14 \text{ lbs/yr}$$

Assigned human food chain population value = 0.03 (from HRS Table 4-18)

Potential Production: Approximately 13 miles of Spearfish Creek is within the surface water TDL and subject to potential contamination.

$$\frac{13 \text{ miles}}{35 \text{ miles}} = 0.3714 \quad 0.3714 \times 250 \text{ lbs/yr} = 93 \text{ lbs/yr}$$

Assigned human food chain population value = 0.03 (from HRS Table 4-18)

HIGHLIGHT 8-57

APPORTIONMENT OF PRODUCTION DATA ALONG A COASTLINE

NMFS collects data on the total annual catch in pounds from the nearshore zone (i.e., 0 to 3 miles from shore). To apportion this data when the TDL includes waters in the nearshore area, determine the total acreage within that area for a state and divide the total annual catch for that state to derive production in pounds per acre. Multiply the acreage within the TIDL by this production figure and use the result as a production estimate.

For example, New Hampshire has 13 miles of coastline. The nearshore zone, therefore, has 39 square miles (i.e., 13 miles x 3 miles) and 24,960 acres (i.e., 39 square miles x 640 acres/square mile). NMFS determined that 689,000 pounds of shellfish and fish were commercially captured in the 0- to 3-mile region in a recent year. Based on this data, the annual catch is approximately 28 pounds per acre. Assuming that the PPE is along a portion of the shoreline that is straight (i.e., an arc with a 3-mile radius encompasses a semi-circle), approximately 9,000 acres are within the TDL, corresponding to a production of about 250,000 pounds per year. Additional production could be determined using NMFS data in the 3- to 12-mile region to estimate commercial landings and by documenting recreational production.

- State recreational marine production data are available for the whole state, and the production can be apportioned based on the length of coastline within the TDL.

It may also be necessary to apportion production so that a production value can be associated with each surface water body type and dilution weight (e.g., to account for changes in flow rate or depth when evaluating potential contamination), and portions of fisheries subject to potential, Level II or Level I concentrations.

- (3) **Apply stocking rates.** If annual production data are not available, a stocking rate for the fishery may be used. Stocking data can provide an indication of food chain production when:

- The stocking is a put-and-take operation;
- The stocked fish population will be caught for human consumption; and
- The stocked fish population will be caught within the TIDL or within the boundaries of the fishery being evaluated.

Appropriate stocking data have been used for places like Colorado and West Virginia where trout are released for the spring fishing season and are usually all caught by early summer. Stocking data are usually not appropriate when yearlings or juveniles are released to maintain natural species balance or to build up populations after a decline.

- (4) **Evaluate closed fisheries.** For a closed fishery subject to actual human food chain contamination (i.e., when a hazardous substance for which the fishery or a portion of the fishery was closed is documented in an observed release to the fishery from the site), estimate fishery production based on data collected before the fishery was closed.
- (5) **Sum all data.** If data represent different types of fisheries (i.e., subsistence, commercial, or recreational) or different species (e.g., finfish and shellfish), the production for each type of fishery and species can be summed to determine the total production for the fishery being evaluated. For an example, see **Highlight 8-58**.
- (6) **Evaluate fisheries with no production data.** If neither annual production data nor stocking rates are available, continue with the guidance in the next subsection.
- (7) **Calculate the human food chain production factor.** See Section 8.12.

HIGHLIGHT 8-58 SCORING EXAMPLE FOR POTENTIAL CONTAMINATION

- Big River is a fishery for four salmon species (chinook, chum, coho, and pink). The river is about 90 miles long when measured from its headwaters to coastal tidal waters (i.e., Deep Sound), and its average width is 200 yards. Thus, the entire river covers an area of approximately 6550 acres. The TDL includes 12 miles of Big River and 3 miles of Deep Sound. Each fishery is subject only to potential contamination and each is associated with a different flow rate (i.e., Big River ranges from 9,600-9,900 cfs/year; Deep Sound is characteristic of coastal tidal waters).
- The state maintains production data for several stations along the Big River and one station falls within the TDL. The state fishery management official commented that the production for this station was not representative of the actual production within this portion of the salmon fishery. Thus, the scorer apportioned annual production associated with the entire river to the portion of the fishery within the TDL.
- The 10-year average total production for pink salmon is about 200,000 fish/year, and all of these fish pass through in-water segment and spend an extended period of time within Big River. The average weight usable for human consumption of each adult pink salmon is about 5.0 pounds. Thus, the annual production for pink salmon within the entire length of the Big River is approximately 1,000,000 pounds/year or roughly 150 pounds/acre-year.
- Since the 12 miles of Big River within the TDL covers about 870 acres.
- $870 \text{ acres} \times 150 \text{ pounds/year-acre} = 130,500 \text{ pounds/year}$
- This value equals the annual production for pink salmon within the TDL. Based on similar estimations for the other salmon species, the total annual production for the portion of the Big River within the TDL for all four salmon species is 640,000 pounds. A human food chain population value of 310 is assigned from HRS Table 4-18.
- Annual production for the Deep Sound fishery was based on 5 years of commercial harvest data, and 3 years of recreational harvest data. Production estimates based on State Department of Fisheries recreational salmon management and catch reporting data were added to production from commercial harvest records provided by NMFS. The total annual production for Deep Sound is 2,300,000 pounds. A human food chain population value of 3,100 is assigned from HRS Table 4-18.
- Calculate annual production for each fishery separately, multiply by the appropriate dilution weight, sum, and multiply by 0.1 for potential human food chain contamination.

Big River $310 \times 0.001 = 0.31$

Deep Sound $3,100 \times 0.0001 = 0.31$

Potential Human Food Chain Contamination Factor Value for the Watershed = $0.62 \times 0.1 = 0.06$

This value of 0.06 represents the population factor value for the watershed since no fisheries were subject to actual contamination.

ESTIMATING PRODUCTION USING SURROGATE DATA

If estimates of annual production data specific to the fishery are not available, estimate production by collecting information for similar surface water bodies containing comparable fisheries. Determine if the surrogate fishery (and the water body itself is similar to the fishery being evaluated in terms of:

- Fish species or other human food chain organisms present (e.g., production data for a fishery consisting primarily of pike should not be used when evaluating a fishery consisting primarily of smallmouth bass);
- Flow rate (or depth for oceans);
- Characteristics (e.g., salinity, flow, depth, subsurface bottom, state classification, overall water quality);
- Distance from each water body to possible surrogate water body; and
- Fishing activities.

Consider these criteria before assuming that production data from a similar water body can be used for estimating production for the fishery (or portions of the fishery) within the TDL. State fish and game officials are a likely source for such information. Document the rationale for using surrogate data from another fishery for the fishery being evaluated.

For example, production data for a fishery consisting primarily of trout could be used for a fishery consisting of trout that is 30 miles away. The average annual flows of both water bodies should be similar even though the surface water dilution weight assigned to each water body may be different (e.g., a small to moderate stream may have a flow of 90 cfs (an assigned dilution weight of 0.1) while an acceptable surrogate fishery may be a moderate to large stream having a flow of 140 cfs (an assigned dilution weight of 0.01)). In addition, the characteristics of both the surrogate water body and the water body within the TDL should share similar attributes. Both should be either managed as a high quality cold-water fishery or be managed as a limited warm-water fishery. Likewise, both should be either annually stocked and aggressively managed for sport fishing or not stocked.

ESTIMATING PRODUCTION WITHOUT ACTUAL OR SURROGATE DATA

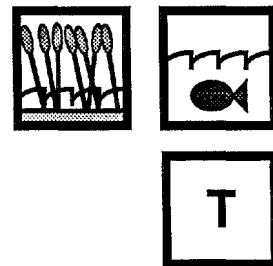
If surface water is documented to be a fishery and production data (actual and surrogate) are not available, assign the fishery a minimum human food chain production of greater than 0 pounds per year. Then, assign the fishery a human food chain population value of 0.03 based on HRS Table 4-18. Use this human food chain population value to assign factor values for Level I concentrations, Level II concentrations, and potential human food chain contamination. Show that the fishery supports human food chain organisms by documenting that at least one human food chain organism lives within fishery boundaries and that fishing occurs in the surface water body.

TIPS AND REMINDERS

- To evaluate human food chain production:
 - Determine the population factor value needed to significantly affect the site score.
 - Review **Highlights 8-52** and **8-53** to determine the annual production that would required to achieve this population factor value.
 - Determine if such production is likely. If so, try to obtain production data from local officials. If unsure about the amount of annual production for a fishery, or about using a particular production surrogate value, ask the officials if such production is likely.
 - If such production is unlikely, or if production data are not readily available, either assign a value based on the level of contamination present using a production value of greater than 0 pounds per year or see below. For all fisheries scored using a production value greater than 0, assign a value of 0.03 for human food chain population for that fishery.
 - In many cases, evaluating production for those fisheries subject to potential contamination will not significantly affect the human food chain threat targets score; therefore, the minimum assigned value of 0.03 for the human food chain population factor does not have to be used for evaluating a fishery subject to potential contamination. Instead, reference the absence of this information and indicate in the HRS documentation record that no reasonable production estimate can be made at the time of scoring.
- For potential contamination, do not use that the dilution weight for the 3-mile mixing zone in quiet flowing rivers; rather, assign the dilution weight based on average annual flow.
- In the absence of actual contamination, large productions are generally necessary to significantly affect the human food chain threat targets score. Therefore, pursue production data for potential contamination only if production for a particular water body is expected to be significant.
- For HRS purposes, standing crop measures or other productivity estimates are not used for estimating food chain production. These estimates do not correlate well with production for various water body types, and are more reflective of biomass (weight of all living organisms in the water body), than of productivity. However, standing crop estimates may help check the validity and adequacy of actual production data, particularly when there are large differences between standing crop and production data, or between several estimates of actual production data. Production data should always be smaller than standing crop.

SECTION 8.14

SENSITIVE ENVIRONMENTS



This section provides general guidance for evaluating sensitive environments in the surface water pathway as well as specific guidance and examples for evaluating more complex situations in which multiple sensitive environments overlap. Sensitive environments include those environments described in HRS Table 4-23 – hereafter referred to as listed sensitive environments – and wetlands as defined in 40 CFR 230.3. Assigning point values to sensitive environments is straightforward in most cases. In other cases (e.g., when the boundaries of several sensitive environments overlap, or if more than one designation may apply to a single environment), this determination may be less obvious; however, most scoring difficulties can be eliminated by treating each sensitive environment as a separate, independent target. This section addresses only the pathway-specific information necessary to evaluate sensitive environments in the surface water pathway. Specific definitions of sensitive environments, sources of information, and steps for identifying sensitive environments are provided in Appendix A. Guidance for determining level of actual contamination is presented in Section 8.15. Wetlands are discussed in more detail in Section 8.16.

RELEVANT HRS SECTIONS

Section 2.5	Targets
Section 2.5.1	Determination of level of actual contamination at a sampling location
Section 2.5.2	Comparison to benchmarks
Section 4.1.4.3	Environmental threat - targets
Section 4.1.4.3.1	Sensitive environments
Section 4.1.4.3.1.1	Level I concentrations
Section 4.1.4.3.1.2	Level II concentrations
Section 4.1.4.3.1.3	Potential contamination
Section 4.1.4.3.1.4	Calculation of environmental threat - targets factor category value

DEFINITIONS

Actual Contamination for Listed Sensitive Environments: Any portion of a listed sensitive environment is subject to actual contamination if it falls within an area that meets the criteria for an observed release. Direct observation and/or analytical data from aqueous, sediment samples, or essentially sessile benthic organism may be used to establish actual contamination. However, only surface water samples may be used to establish Level I concentrations.

Listed Sensitive Environment: Areas that are evaluated as one or more of the sensitive environments listed in HRS Table 4-23, even if these areas (or portions of these areas) also are being evaluated as a wetland. The distinction is necessary because a wetland that is also a listed sensitive environment (e.g., a wetland area that also is habitat known to be used by an endangered species) would be evaluated as two separate sensitive environments. Point values are assigned differently for wetlands than for the other types of sensitive environments.

Sensitive Environment In the Surface Water Pathway. A sensitive environment is defined as a wetland (as defined in 40 CFR 230.3) or any area that meets the criteria listed in HRS Table 4-23. No other areas are considered sensitive environments for the surface water pathway.

SENSITIVE ENVIRONMENTS ELIGIBLE TO BE EVALUATED IN THE SURFACE WATER PATHWAY

All areas that are located along the hazardous substance migration path for a watershed and that meet the definition for a wetland and/or at least one category listed in HRS Table 4-23 are eligible to be evaluated in the surface water pathway for that watershed. In all cases, surface water sensitive environments (including wetlands) along or contiguous to the hazardous substance migration path are eligible. In some cases, terrestrial sensitive environments (as defined in HRS Table 5-5), or the terrestrial portions of sensitive environments, also are eligible to be evaluated in the surface water pathway.

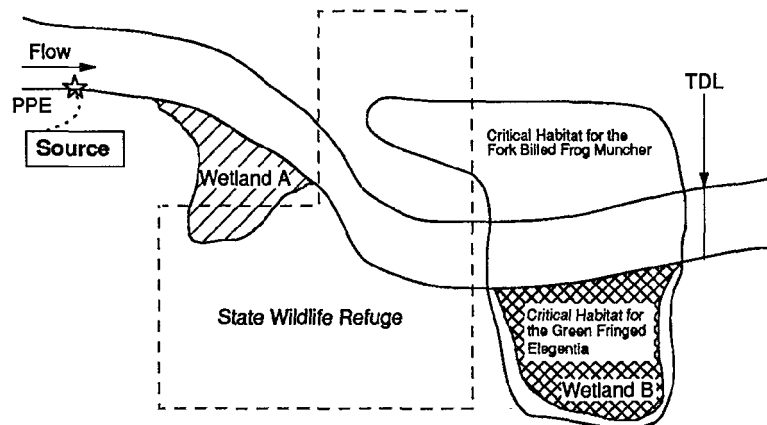
- Terrestrial sensitive environments not defined by the presence of one or more particular species (e.g., wildlife refuges) and whose boundaries cross or border a surface water body within the TDL are always eligible to be evaluated in the surface water pathway.
- Terrestrial sensitive environments defined by the presence of one or more particular species (e.g., habitat known to be used by an endangered or threatened species, terrestrial areas used for breeding by large or dense aggregations of animals) and whose boundaries cross or border a surface water body within the TDL are eligible to be evaluated in the surface water pathway unless there is clear information that the particular species of concern is unlikely to come into contact with surface water bodies within the TDL.
- Terrestrial sensitive environments defined by the presence of one or more particular species and whose boundaries do not cross or border a surface water body within the TDL are eligible to be evaluated in the surface water pathway only if there is clear information that the particular species of concern is likely to come into contact with surface water bodies within the TDL.

Additional guidance for determining if terrestrial sensitive environments are eligible to be evaluated in the surface water pathway is provided in Appendix A.

CALCULATING THE SENSITIVE ENVIRONMENTS FACTOR VALUE

- (1) **Identify all listed sensitive environments within the TDL.** For each sensitive environment, assign the appropriate point value from HFIS Table 4-23. See Appendix A for guidance in identifying sensitive environments. Use the following guidelines in identifying and assigning point values to each sensitive environment:
 - Evaluate each discrete sensitive environment as a separate target, regardless of the degree to which it overlaps with other sensitive environments. For example, a critical habitat for an endangered species has the same point value whether located in a state wildlife refuge or not; the wildlife refuge is evaluated as a separate sensitive environment in either case (see **Highlight 8-59**).

HIGHLIGHT 8-59 SCORING EXAMPLE FOR SENSITIVE ENVIRONMENTS



The above figure is a schematic map (not to scale) of the 15-mile TDL associated with a hypothetical site. From background documents and discussions with appropriate Federal and state agencies, the following information is available:

The entire length of the river between the PPE and the TDL is a Federal designated Scenic River and is a state designated area for the protection of aquatic life. The areas identified as Wetland A and B are wetlands. Wetland B is also designated as Critical Habitat for the Green Fringed Elegentia, a hypothetical Federal designated plant species. The labelled area delineated by large dashed lines is a designated State Wildlife Refuge. The labelled area delineated by a continuous line is designated as Critical Habitat for the Fork Billed Frog Muncher, a hypothetical Federal designated endangered bird species whose diet consists entirely of frogs.

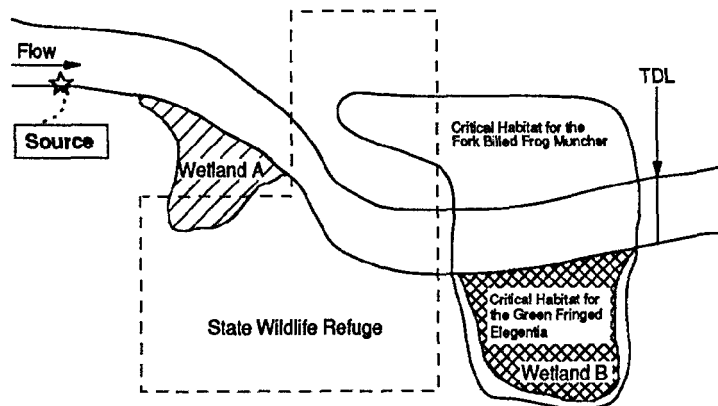
Based on this information, and by referring to HRS Tables 4-23 and 4-24, seven separate sensitive environments are identified:

- The entire length of the river between the PPE and the TDL is identified as a Federal designated Scenic River and assigned a value of 50 points;
- The entire length of the river between the PPE and the TDL is also identified as a state designated area for the protection of aquatic life and assigned a value of 5 points;
- Wetland A is identified as a wetland and will be assigned a point value based on its total linear frontage with the river and the levels of contamination under which it is evaluated (see Section 8.16);
- The area delineated by dashed lines is identified as a designated State Wildlife Refuge and assigned a value of 75 points;
- The area delineated by a continuous line is identified as Critical Habitat for a Federal designated endangered species and assigned a value of 100 points;
- Wetland B is identified as a wetland and will be assigned a point value based on its total linear frontage with the river and the level(s) of contamination under which it is evaluated (see Section 8.16);
- Wetland B is also identified as Critical Habitat for a Federal designated threatened species and assigned a value of 100 points.

These seven sensitive environments are illustrated further on the following page.

(continued on next page)

HIGHLIGHT 8-59 (continued) **SCORING EXAMPLE FOR SENSITIVE ENVIRONMENTS**



<u>Sensitive Environment</u>	<u>Designation</u>	<u>Assigned Value</u>
	1) Federal designated Scenic River	50
	2) Designated area for the maintenance of aquatic life	5
	3) Wetland	Dependent on linear frontage
	4) State Wildlife Refuge	75
	5) Critical Habitat for the Fork Billed Frog Muncher	100
	6) Wetland	Dependent on linear frontage
	7) Wetland as Critical Habitat for the Green Fringed Elegentia	100

- Evaluate "critical habitat for" or "habitat known to be used by" endangered or threatened species as follows:
 - Identify at least one distinct habitat for each individual species (e.g., if there are three different species, identify three or more habitats, even if they partially or completely overlap (see **Highlight 8-59**)).
 - For each individual species, assign only the endangered or threatened category that results in the highest point value. For example, if the same species is both a Federal proposed threatened species (75 points), and a state designated endangered species (50 points), evaluate the species as a Federal proposed threatened species for HRS scoring purposes.
 - If both "critical habitat for" and "habitat known to be used by" the same species occur within the TDL, consider each a separate sensitive environment for HRS scoring purposes. However, if these areas overlap within the TDL, evaluate the overlapping area only as "critical habitat for" the species (i.e., do not consider the zone of overlap as both "critical habitat for" and "habitat known to be used by" the species). In other words, overlapping areas designated as "critical habitat for" an endangered or threatened species cannot also be evaluated as "habitat known to be used by" the same species.

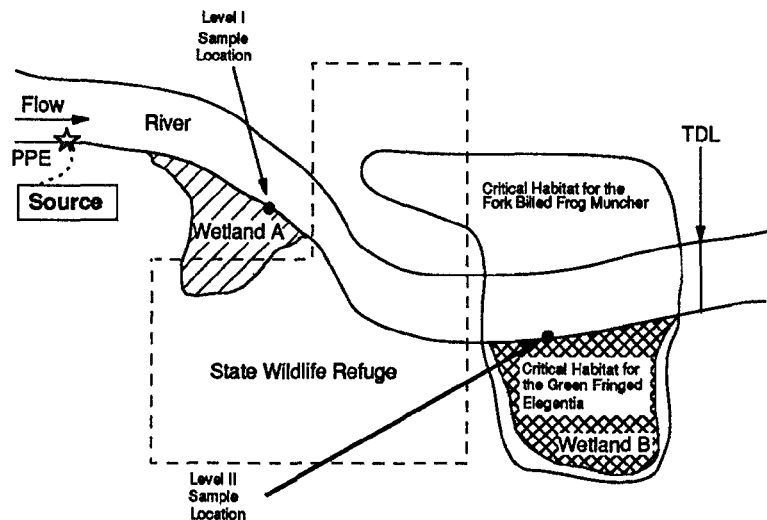
(2) **Evaluate level of contamination for each listed sensitive environment.** See Section 8.15 for guidance on determining level of actual contamination (see **Highlight 8-60**).

- Level I: Identify each listed sensitive environment subject to Level I concentrations and sum their assigned point values (from HRS Table 4-23) to obtain the Level I value for listed sensitive environments.
- Level II: Identify each listed sensitive environment subject to Level II concentrations and sum their assigned point values (from HRS Table 4-23) to obtain the Level II value for listed sensitive environments.
- Potential contamination:
 - Identify each listed sensitive environment subject to potential contamination.
 - Multiply its assigned point value (from HRS Table 4-23) by the appropriate dilution weight (from HRS Table 4-13) for the surface water body within which the sensitive environment is located.
 - Sum these products to obtain the potential contamination value for listed sensitive environments.

(3) **If wetlands are present, determine whether each discrete wetland should be evaluated under Level I concentrations, Level II concentrations, potential contamination, or a combination of these.** See Section 8.15 for guidance on determining level of contamination for wetlands. (Also see **Highlight 8-60**).

(4) **Determine the length of each discrete wetland evaluated under each level of contamination and assign the appropriate wetland rating value.** Wetland scoring depends on size (i.e., linear frontage or perimeter) while all other sensitive environments are scored independently of their size. Guidance on determining wetland length under Level I concentrations, Level II concentrations, and potential contamination is provided in Section 8.16.

HIGHLIGHT 8-60 SCORING EXAMPLE FOR LEVEL I AND LEVEL II CONTAMINATION



The above figure is a schematic map (not to scale) of the 15-mile TDL associated with the same hypothetical site as illustrated in **Highlight 8-59**. In this example, however, analytic sampling results indicate that Level I concentrations are present from the PPE to Point 1 (i.e., the Level I Sample Location), and Level II concentrations are present from Point 1 to Point 2 (i.e., the Level II Sample Location).

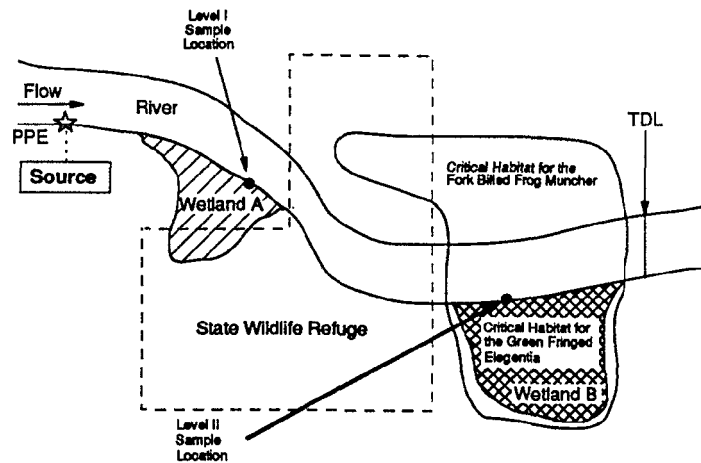
Based on the location of the sensitive environments within the TDL relative to the sampling points, they are scored under the following contamination levels:

- The length of the river between the PPE and TDL identified as a Federal designated Scenic River is scored under Level I concentrations (both Level I and Level II concentrations are present within this sensitive environment).
- The length of the river between the PPE and TDL identified as a state designated area for the protection of aquatic life is scored under Level I concentrations (see above).
- Wetland A is scored under both Level I and Level II concentrations as a result of its location relative to Point 1. The length of Wetland A adjacent to the river upstream of Point 1 is scored under Level I concentrations; the length of Wetland A adjacent to the river downstream of Point 1 is scored under Level II concentrations.
- The entire area identified as a State Wildlife Refuge is scored under Level II concentrations.
- The entire area identified as Critical Habitat for the Fork Billed Frog Muncher is scored under Level II concentrations.
- Wetland B, when being evaluated as a wetland, is scored under both Level II concentrations and potential contamination as a result of its location relative to Point 2. The length of Wetland B adjacent to the river upstream of Point 2 is scored under Level II concentrations; the length of Wetland B adjacent to the river downstream of Point 2 is scored under potential contamination.
- Wetland B, when being scored as critical habitat, is scored under Level II concentrations.

These seven sensitive environments are illustrated further on the following page.

(continued on next page)

HIGHLIGHT 8-60 (continued) **SCORING EXAMPLE FOR LEVEL I AND LEVEL II CONTAMINATION**



<u>Sensitive Environment</u>	<u>Designation</u>	<u>Contamination Level</u>
	1) Federal designated Scenic River	Level I
	2) Area for the maintenance of aquatic life	Level I
	3) Wetland	Level I upstream of Point 1, Level II downstream of Point 1
	4) State Wildlife Refuge	Level II
	5) Critical Habitat for the Fork Billed Frog Muncher	Level II
	6) Wetland	Level II upstream of Point 2, potential downstream of Point 2
	7) Wetland as Critical Habitat for the Green Fringed Elegetia	Level II

- Level I: Determine the total length of the wetlands subject to Level I concentrations, and assign the appropriate wetland rating value using HRS Table 4-24. Assign this value as the Level I value for wetlands.
- Level II: Determine the total length of the wetlands subject to Level II concentrations, and assign the appropriate wetland rating value using HRS Table 4-24. Assign this value as the Level II value for wetlands.
- Potential contamination:
 - Determine the total length of wetlands subject to potential contamination for each type of surface water body (as defined in HRS Table 4-13).
 - Based on this total length for each type of surface water body, obtain the appropriate wetlands rating value using HRS Table 4-24.
 - Multiply the wetlands rating value for each surface water body by the appropriate dilution weight for the surface water body as defined in HRS Table 4-13.
 - Sum these products and assign this value as the potential contamination value for wetlands.

(5) **Calculate the Level I concentrations factor value, the Level II concentrations factor value, and the potential contamination factor value.**

- Level I: Sum the assigned Level I values for wetlands and listed sensitive environments and multiply that value by 10. Assign this value as the Level I concentrations factor value.
- Level II: Sum the assigned Level II values for wetlands and listed sensitive environments and assign this value as the Level II concentrations factor value.
- Potential contamination: Sum the assigned potential contamination values for wetlands and listed sensitive environments and divide that value by 10. If the result is one or greater, round to the nearest integer. If the result is less than one, do not round. Assign this value as the potential contamination factor value.

(6) **Calculate the environmental threat-targets factor category value.** Sum the factor values for Level I concentrations, Level II concentrations, and potential contamination. Assign this value as the environmental threat-targets factor category value.

TIPS AND REMINDERS

- Identify at least one separate sensitive environment (i.e., "critical habitat for" or "habitat known to be used by") for each endangered or threatened species, but assign only one category (e.g., Federal endangered, state threatened) to each species.
- Designation of state threatened or endangered species are valid only within that state.
- A wetland area can be evaluated both as a wetland and as a listed sensitive environment (e.g., critical habitat).
- The minimum total wetland length within a given level of contamination or dilution category to obtain a non-zero wetlands rating value from HRS Table 4-24 is 0.1 miles.

SECTION 8.15

LEVEL I AND Level II

CONCENTRATIONS FOR

LISTED SENSITIVE

ENVIRONMENTS



This section provides guidance for the types of observations, samples, and benchmarks used to establish Level I or Level II concentrations and potential contamination for listed sensitive environments. The sensitive environments factor value in the surface water pathway is assigned based on whether sensitive environments within the TDL are considered subject to actual contamination (i.e., Level I or Level II concentrations) or potential contamination, and on the assigned value for each sensitive environment. In order to establish actual contamination, an observed release must be documented (either by direct observation or by chemical analysis) for the location in the surface water body where targets are present. To determine the level of actual contamination by chemical analysis, concentrations of hazardous substances are measured in samples that meet the criteria for an observed release and that are taken within, beyond, or adjacent to a sensitive environment within the TDL; these concentrations are then compared to ecological-based benchmarks. Wetlands are discussed in more detail in Section 8.17.

RELEVANT HRS SECTIONS

Section 2.5	Targets
Section 2.5.1	Determination of level of actual contamination at a sampling location
Section 2.5.2	Comparison to benchmarks
Section 4.1.4.3	Environmental threat - targets
Section 4.1.4.3.1	Sensitive environments
Section 4.1.4.3.1.1	Level I concentrations
Section 4.1.4.3.1.2	Level II concentrations

DEFINITIONS

Actual Contamination for Listed Sensitive Environments: Any portion of a listed sensitive environment is subject to actual contamination if it falls within an area that meets the criteria for an observed release. Direct observation and/or analytical data from aqueous, sediment samples, or essentially sessile benthic organism may be used to establish actual contamination. However, only surface water samples may be used to establish Level I concentrations.

Level I Concentrations for the Environmental Threat: Level I concentrations are established in aqueous samples in which the concentration of a hazardous substance that meets the criteria for an observed release is at or above the appropriate ecological-based benchmark. Benchmark for the environmental threat include AWQC and AALAC. I and J indices do not apply because there are no screening concentration benchmark for sensitive environments.

Level II Concentrations for the Environmental Threat: Level II concentration are established in samples in which the concentration of at least one hazardous substance meets the criteria for an observed release, but the conditions for Level I concentrations are not met. In addition, Level II is assigned for observed established by direct observation.

Listed Sensitive Environment: Areas that are evaluated as one or more of the sensitive environments listed in HRS Table 4-23, even if these areas (or portions of these areas) also are being evaluated as a wetland. The distinction is necessary because a wetland that is also a listed sensitive environment (e.g., a wetland area that also is habitat known to be used by an endangered species) would be evaluated as two separate sensitive environments. Point values are assigned differently for wetlands than for the other types of sensitive environments.

Observed Release: An observed release is established for the ground water, surface water, or air migration pathway either by chemical analysis or by direct observation. Observed release is not relevant to the HRS soil exposure pathway. The minimum requirements for establishing an observed release by chemical analysis are analytical data demonstrating the presence of a hazardous substance in the medium significantly above background level, and information that some portion of that increase is attributable to the site. The minimum criterion for establishing an observed release by direct observation is evidence that the hazardous substance was placed into or has been seen entering the medium.

DETERMINING LEVEL OF CONTAMINATION

The following steps describe how to determine whether a listed sensitive environment is considered subject to Level I concentrations, Level II concentrations, or potential contamination.

- (1) **Identify all listed sensitive environments within the TDL.** Guidance for identifying and delineating listed sensitive environments is provided in Appendix A. Delineate the position and boundaries of these sensitive environments and their position relative to the hazardous substance migration path. It may be helpful to note these locations on a scale map or diagram.
- (2) **Delineate all areas of actual contamination within the TDL.** The procedures for delineating areas of actual contamination depend on whether actual contamination is established based on chemical analysis or direct observation.
 - Delineate areas of actual contamination based on chemical analysis:
 - For rivers and streams, the area of actual contamination is the area between the PPE for a hazardous substance and the location of the farthest "hit" (i.e., the farthest sampling location that meets the criteria for an observed release by chemical analysis). At sites where there are multiple sources and PPEs, it may be necessary to establish an area of actual contamination for each hazardous substance (i.e., the area between the PPE for that substance and the location of the farthest "hit" for that substance). On a scale map or diagram, draw a line from bank-to-bank at the appropriate PPE, and draw a second line from bank-to-bank at the location of the farthest "hit." The lines from bank-to-bank should be drawn roughly perpendicular to both banks. The portion of the river or stream between the two lines is the area of actual contamination for that hazardous substance. In tidally influenced rivers and streams, the area of actual contamination can be both upstream and downstream of the appropriate PPE(s).
 - For lakes, coastal tidal waters, and oceans, the area of actual contamination for a hazardous substance is the area within an arc with a radius from the PPE for that hazardous substance to the location of the farthest "hit." At sites

where there are multiple sources and PPEs, it may be necessary to establish an area of actual contamination for each hazardous substance. On a scale map or diagram, draw an arc using the appropriate PPE as the center point and the distance between this point and the location of the farthest "hit" as the radius. Continue drawing this arc in each direction until it reaches the shores of the water body or completes a circle. The area within this arc is the area of actual contamination.

- Delineate areas of actual contamination based on direct observation. Actual contamination of a sensitive environment based on direct observation can be established at Level II concentrations if the observation is made at some point within the sensitive environment. It may be helpful to note these locations on a scale map or diagram.

(3) **Delineate areas subject to Level I and Level II concentrations within areas of actual contamination based on chemical analysis.** Delineate areas subject to Level I and Level II concentrations as follows:

- For each surface water sample location that meets the observed release criteria, determine whether the sample location is considered subject to Level I or Level II concentrations as follows:
 - If the concentration of any hazardous substance is equal to or greater than its ecological-based benchmark, the sample location is subject to Level I concentrations.
 - If the concentrations of all hazardous substances for which an applicable benchmark is available are lower than their respective ecological-based benchmarks, the sample location is subject to Level II concentrations.
 - If none of the hazardous substances has an applicable benchmark, the sample location is considered subject to Level II concentrations.

Use EPA's AWQC and AALAC as the only ecological benchmarks. To determine the appropriate benchmark for the hazardous substance, use the lower of the applicable AWQC and AALAC values, if available, as follows:

- Use the chronic value; otherwise use the acute value.
- If the sensitive environment is in fresh water, use the fresh water value; otherwise, use the marine value.
- If the sensitive environment is in salt water use the marine value; otherwise, use the fresh water value.
- If the sensitive environment is in both fresh water and salt water, or is in brackish water, use the lower of the applicable fresh water and marine values.
- For each sediment or benthic sample location, if any hazardous substance meets the criteria for an observed release, the location is considered subject to Level II concentrations. Sediment and benthic samples cannot be used to establish Level I concentrations.
- Delineate areas subject to Level I concentrations as follows (if both fresh and brackish or salt water bodies are within the TDL, note the final two bullets in Step (3) below):

- For rivers and streams, the area subject to Level I concentrations is the area between the PPE and the location of the farthest sample location subject to Level I concentrations. On a scale map or diagram, draw a line from bank-to-bank at the farthest location subject to Level I concentrations. The portion of the river or stream between the two lines at the appropriate PPE (see Step (2) above) is the area subject to Level I concentrations.
- For lakes, coastal tidal waters, and oceans, the area subject to Level I concentrations generally is the area within an arc with a radius from the PPE to the farthest location subject to Level I concentrations. On a scale map or diagram, draw an arc using the appropriate PPE as the center point and the distance between this point and the farthest location subject to Level I concentrations as the radius. Continue drawing this arc in each direction until it reaches the shores of the water body or completes a circle. The area within this arc is the area subject to Level I concentrations.
- Delineate areas subject to Level II concentrations as follows (if both fresh and brackish or salt water bodies are within the TDL, note the final two bullets in Step (3)):
- For rivers and streams, the area subject to Level II concentrations generally is the area between the location of the farthest sample location that is considered subject to Level I concentrations and the location of the farthest sample location considered subject to Level II concentrations (i.e., the area of actual contamination that is not considered subject to Level I concentrations). The portion of the river or stream between the line at the farthest sample location subject to Level I concentrations (see above) and the line at the farthest sample location that meets the criteria for an observed release (see Step (2) above) is the area subject to Level II concentrations.
- For lakes, coastal tidal waters, and oceans, the area subject to Level II concentrations generally is the area between the arc drawn through the farthest sampling location considered subject to Level I concentrations (see above) and the arc drawn through the farthest sample location considered subject to actual contamination (see Step (2) above). The area within these two arcs is the area considered subject to Level II concentrations.
- If the listed sensitive environments within the TDL are present in, or adjacent to, both fresh water and brackish or salt water, then it may be necessary to establish separate areas of Level I and Level II concentrations for the fresh water and the brackish or salt water. For some hazardous substances, the marine ecological-based benchmark is lower than the fresh water benchmark. Thus it is possible for areas subject to Level I concentrations (based on the marine benchmark) to be farther from the PPE than areas subject to Level II concentrations (based on the fresh water benchmark).
- If the stream or river is tidally influenced, see Section 8.1.

(4) **Determine which listed sensitive environments are considered subject to Level I concentrations, Level II concentrations, and potential contamination.** Level of contamination for each listed sensitive environment is determined by the relative position of its boundaries to areas subject to Level I and Level II concentrations. Determine the appropriate level of contamination for each listed sensitive environment within the TDL as noted below.

- If any portion of the listed sensitive environment falls within an area considered subject to Level I concentrations, the entire sensitive environment is considered subject to Level I concentrations.

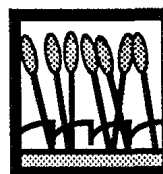
- If any portion of the listed sensitive environment falls solely within an area subject to Level II concentrations (or actual contamination), the entire sensitive environment is considered subject to Level II concentrations.
- If no portion of the listed sensitive environment falls within an area of actual contamination (i.e., Level I or Level II concentrations), the sensitive environment is considered subject to potential contamination.
- If any portion of the listed sensitive environment is considered subject to both Level I and Level II concentrations (or potential contamination), evaluate the sensitive environment under Level I concentrations. For example, if one portion of a National Park is within an area considered subject to Level I concentrations, and another portion of the Park is within an area considered subject to Level II concentrations, the entire National Park is considered subject to Level I concentrations.

TIPS AND REMINDERS

- Direct observation can establish Level II concentrations for a sensitive environment, but only if the observation is within the boundaries of the sensitive environment.
- Surface water samples can be used to establish both Level I and Level II concentrations; sediment and benthic samples can be used only to establish Level II concentrations.
- Only those hazardous substances that meet the criteria for an observed release at a surface water sample location should be compared to ecological-based benchmarks.
- Level I concentrations for a sensitive environment cannot be established using the I or J index.
- If any portion of a listed sensitive environment is considered subject to a given level of contamination, the entire sensitive environment is considered subject to that level of contamination. Only wetland scoring is based on the size of the sensitive environment subject to a particular level of contamination.
- If a listed sensitive environment can be considered subject to more than one level of contamination, evaluate that sensitive environment under the level of contamination that will result in the highest targets factor value (i.e., evaluate it under Level I concentrations, if possible; otherwise, under Level II concentrations, if possible; otherwise, under potential contamination).
- Any samples (surface water, sediment, or benthic) taken within, adjacent to, or beyond a sensitive environment can establish actual contamination.
- The area of actual contamination in the environmental threat will be identical to that in the drinking water threat. However, the areas of Level I and Level II concentrations within the area of actual contamination may differ between the two threats and will need to be established separately. The area of actual contamination in the human food chain threat may differ from that in the drinking water and environmental threats (e.g., if the hazardous substance that establishes actual contamination has a BPFV of less than 500, actual contamination may not be established for the human food chain threat).
- If sensitive environments for the site are present in both fresh water and salt or brackish water, then areas of Level I and Level II concentrations may need to be established separately for the fresh water and the salt or brackish water bodies.

SECTION 8.16

WETLANDS



This section provides guidance to assist the scorer in identifying wetlands, evaluating wetlands, and developing effective scoring strategies for wetlands. The guidance in this section is limited to considerations for the surface water pathway (environmental threat). In the environmental threat, wetlands are evaluated based on level of contamination (i.e., Level I, Level II, or potential) and size (i.e., length or perimeter of wetland area subject to a given level of contamination). To evaluate wetlands, the scorer should document the presence of all wetlands within the TDL, delineate their boundaries sufficiently so that length or perimeter may be estimated, and determine what portions of each wetland are considered subject to Level I concentrations, Level II concentrations, or potential contamination.

RELEVANT HRS SECTIONS

Section 4.0.2	Surface water categories
Section 4.1.4.3	Environmental threat - targets
Section 4.1.4.3.1	Sensitive environments
Section 4.1.4.3.1.1	Level I concentrations
Section 4.1.4.3.1.2	Level II concentrations
Section 4.1.4.3.1.3	Potential contamination

DEFINITIONS

Wetlands: Generally include swamps, marshes, bogs, and similar areas. As defined in 40 CFR 230.3, wetlands are those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands can be natural or man-made. Wetlands identified using other definitions (e.g., the Food Security Act of 1985, the wetlands classification system of the U.S., the 1989 Federal Manual for Identifying and Delineating Jurisdictional Wetlands) are not eligible unless they also meet the 40 CFR 230.3 definition. A discussion of the wetland classification system used on NWI maps and its relationship to the 40 CFR 230.2 definition is provided in Appendix A.

IDENTIFYING AND DELINEATING WETLANDS

Identify and delineate wetlands using readily available maps, brief written documentation (e.g., a statement that hydrophytic vegetation is present), or photographs. If historical data document the presence of a wetland (e.g., an old topographic map), and the SI shows that the wetland no longer exists, score the wetland if it was eliminated because of activity related to the site. However, the wetland should not be scored if it was eliminated for reasons not related to the site.

There are two common methods to identify and determine the length (or perimeter) of wetlands subject to actual or potential contamination:

- Using maps (e.g., National Wetland Inventory maps, USGS topographic maps, Soil Conservation Service (SCS) soil maps) or other documentation (e.g., aerial photo); and
- Contacting a wetlands expert to delineate the wetlands.

For most wetland evaluations, NWI maps can support reasonable estimates of the presence and boundaries of wetlands. However, wetlands identified on these maps may not meet the definition of a wetland as stated in 40 CFR 230.3 and may not be eligible for HRS scoring (see Appendix A). When wetlands may significantly impact the site score (i.e., result in a site score greater than 28.50), further documentation may be needed to show that the wetlands meet the definition in 40 CFR 230.3 (documentation may include contacting a wetlands expert to delineate the wetlands).

DETERMINING WETLAND SIZE (LENGTH OR PERIMETER)

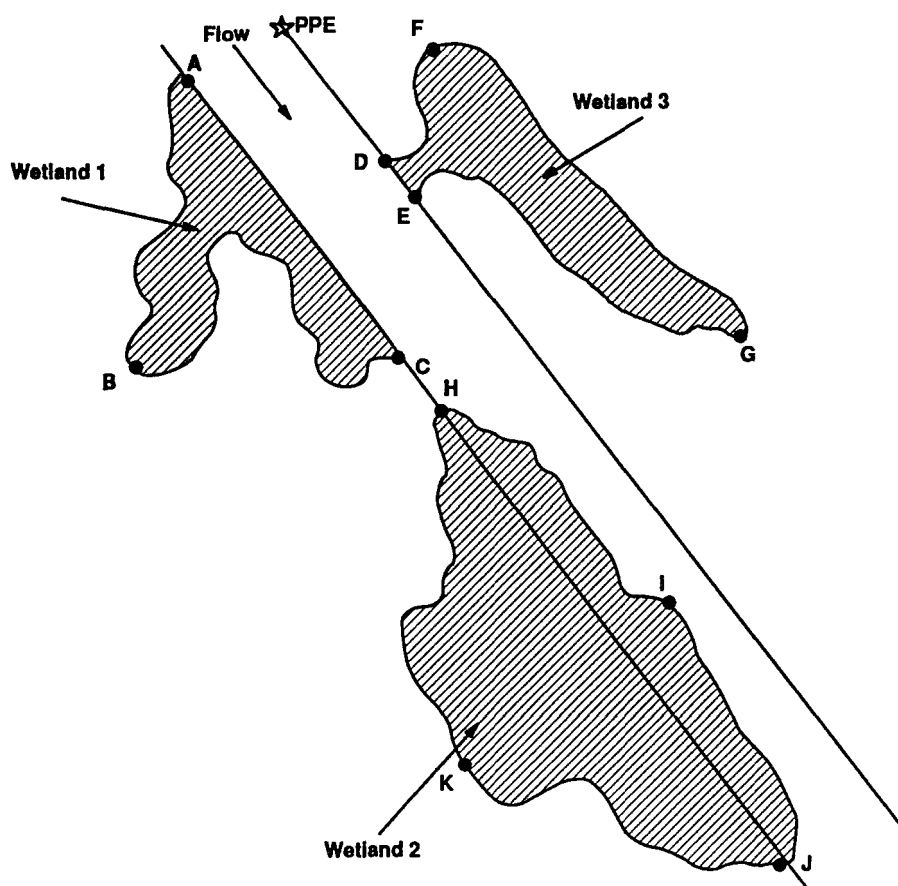
To develop a targets score for the environmental threat pathway, the scorer must assess the length or perimeter of all wetlands within the TDL. Common situations for which the scorer determines wetland length include:

- Wetlands contiguous to a river or stream (see **Highlight 8-61**);
- Wetlands contiguous to a lake, coastal tidal water, or ocean (see **Highlight 8-62**);
- A watershed with wetlands contiguous both to a river and to a lake or ocean (see **Highlight 8-63**); or
- Wetlands divided by a stream or river (see **Highlight 8-64**).

Common situations for which the scorer determines wetland perimeter include:

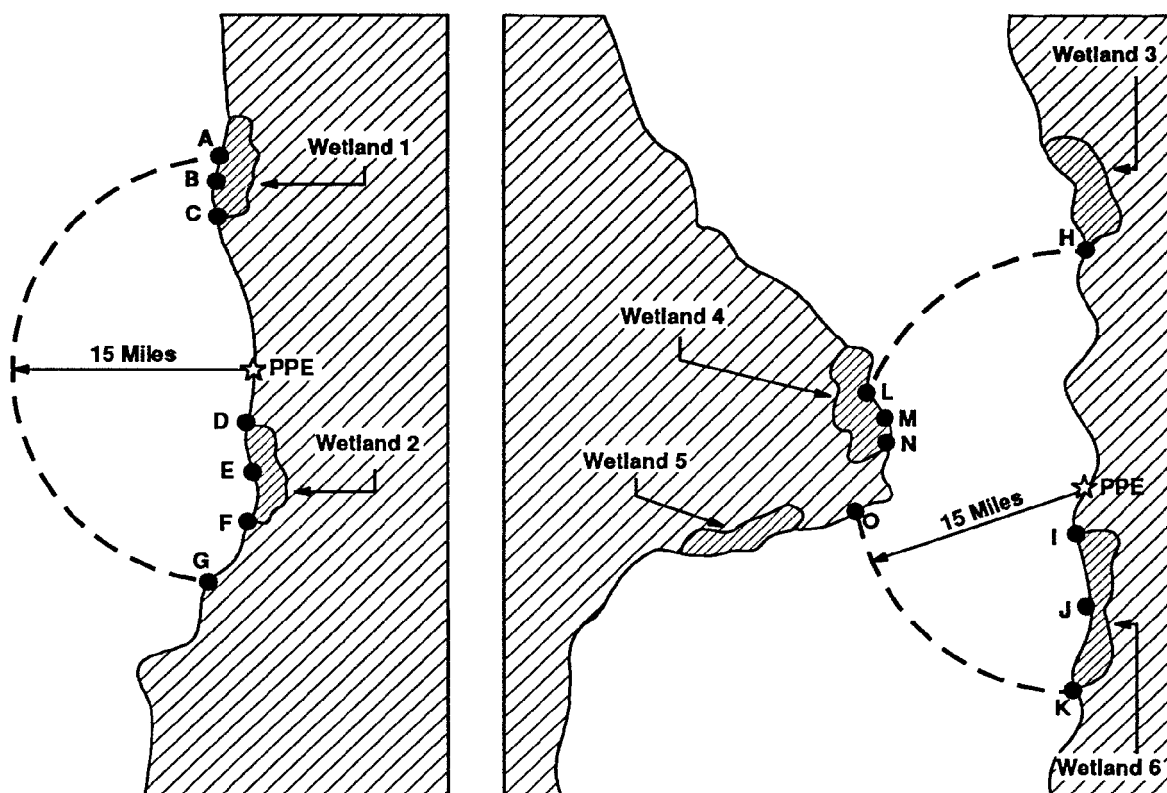
- Isolated wetlands (see **Highlight 8-65**); or
- Wetlands where the PPE into surface water is in the wetland (see **Highlight 8-65**).

HIGHLIGHT 8-61 **DETERMINING LENGTH FOR WETLANDS ALONG A RIVER**



- The length of wetlands along a river or stream is determined by the frontage of wetlands contiguous to the waterway. The distance should be measured as the actual shoreline (frontage) distance and not the straight-line distance between the upstream and downstream points where the wetland meets the surface water body. In this example:
 - Frontage for Wetland 1 is the distance A to C, not the distance A to B to C.
 - Frontage for Wetland 2 is the distance H to I to J, not the distance H to J.
 - Length for Wetland 3 is the distance D to E.

HIGHLIGHT 8-62 **DETERMINING LENGTH FOR WETLANDS ALONG A LAKE, COASTAL** **TIDAL WATER, OR OCEAN**

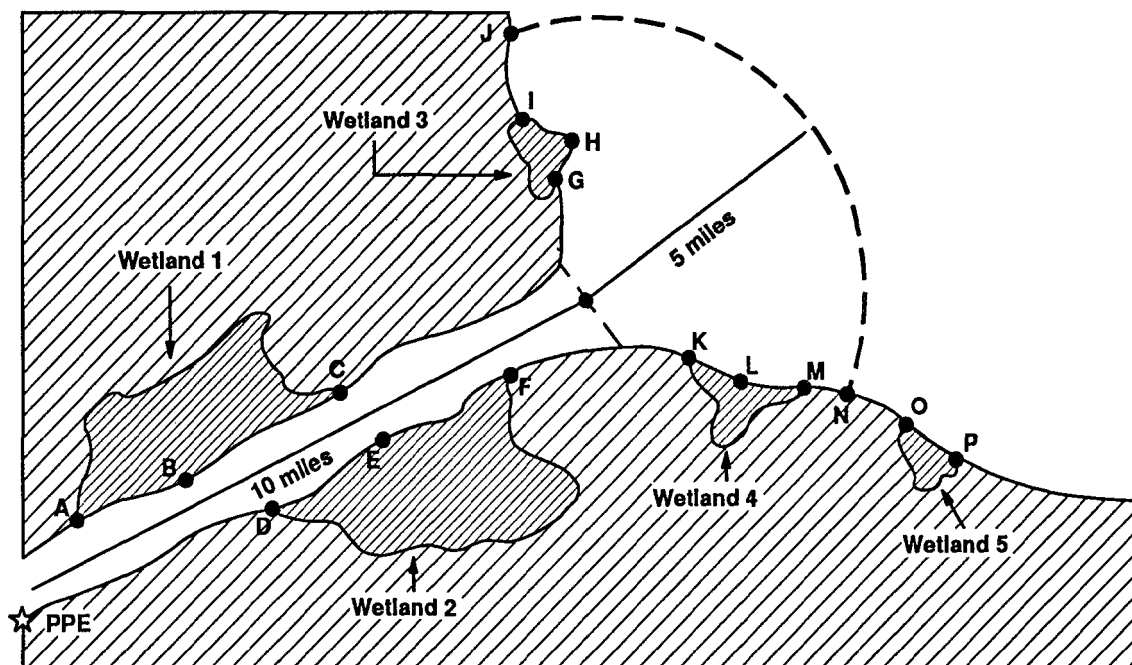


Example 1

Example 2

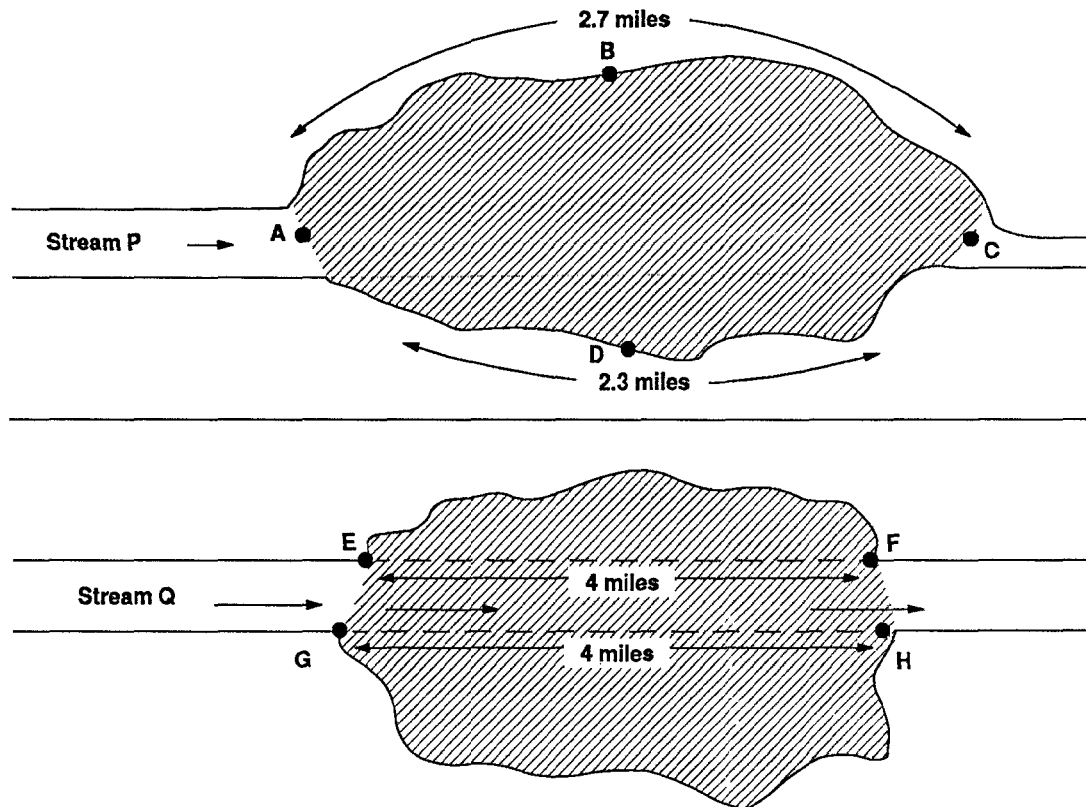
- In Example 1, the arc A-G (15-mile radius) centered on the coastline length to be considered.
- The length of wetlands to be considered is the sum of wetlands within the arc. Length of wetlands should be determined as the coastline length and not a straight-line distance. For this example the following should be considered:
 - Frontage for Wetland 1 (the distance A to B to C); and
 - Frontage for Wetland 2 (the distance D to E to F).
- In Example 2, the arc H-K (15-mile radius) centered on the PPE is drawn to determine the coastline length to be considered.
- The length of wetlands to be considered is the sum of wetlands within the arc. Length of wetlands should be determined as the coastline length and not a straight-line distance. For this example, the following should be considered:
 - Frontage for Wetland 4 (the distance L to M to N); and
 - Frontage for Wetland 6 (the distance I to J to K).

HIGHLIGHT 8-63 **DETERMINING LENGTH FOR WETLAND IN A WATERSHED** **WITH A RIVER AND LAKE, OR COASTAL TIDAL WATER**



- The wetlands frontage is calculated as the sum of the length of wetlands contiguous to the river portion of the hazardous substance migration pathway and the length of wetlands contiguous to the coastline in the lake or ocean.
- In this example, the total length of wetlands is equal to the length of wetlands associated with the river and the length of wetlands associated with the coastline within the TDL. The radius of the arc into the lake or ocean should be drawn from the center of the river emptying into the lake or ocean and is equal to the TDL (15 miles) minus the length of the TDL in the river or stream (in this example, 10 miles). The following lengths of wetlands should be included:
 - The distance of wetlands along the river, A to B to C and D to E to F; and
 - The distance of wetlands along the coastline within the TDL, G to H to I and K to L to M.

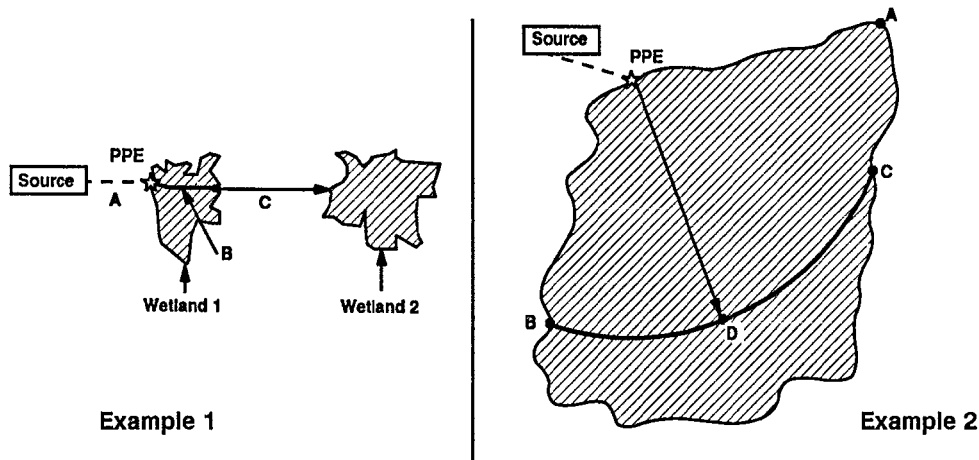
HIGHLIGHT 8-64 **DETERMINING LENGTH FOR WETLAND DIVIDED BY A STREAM**



- For surface water systems with no discernible flow (e.g., a defined channel) through a wetland, the perimeter of the wetland should be considered the wetland length.
- For all surface water systems with a discernible flow through a wetland, the wetlands on opposite banks of the stream should be considered as two wetlands. The length of wetland should be determined for both sides of the water body and added together when determining total length of wetlands.
- In this example, Stream P has no discernible flow through the wetland, and, therefore, the perimeter of the wetland (5 miles) should be considered the length. However, in Stream Q, the stream has a discernible continuous flow through the wetland, and therefore lengths E to F and G to H should be considered as two separate wetlands with a length of 8 miles (4 miles each).

HIGHLIGHT 8-65

DETERMINING PERIMETER OF A WETLAND WHEN THE PROBABLE POINT OF ENTRY IS IN THE WETLAND



- For isolated wetlands or wetlands where the PPE into the surface water body is the wetland, the perimeter of the wetland is used for wetland length rather than the frontage contiguous with the in-water segment of the hazardous substance migration path.
- In Example 1, the PPE is within a perennial, isolated wetland. The scorer should do the following:
 - Measure from the PPE to the end of the TDL and draw an arc.
 - If the boundaries of the isolated wetland are entirely within the arc, the total perimeter should be used as the wetland length.
 - If the wetland is not completely within the arc, measure the perimeter of the wetland within the arc and the length of the arc to determine the wetland length.
 - If the wetland is entirely within the TDL, sum the overland distance from the source to the isolated wetland, the distance of the hazardous substance migration pathway within the isolated wetland, and the overland distance from the isolated wetland to the next surface water body. If this distance is greater than 2 miles, evaluate only the isolated wetland.
 - If the sum of these distances is less than 2 miles, evaluate the next surface water body as a separate watershed. Remember to evaluate the hazardous substance migration path, not the straight-line distance.
- In Example 1, if distance A is less than 2 miles and the total perimeter of Wetland 1 is within the 15-mile TDL, the entire perimeter is used as the wetland length. If the sum of distances A, B (the shortest distance from the PPE to the hazardous substance migration pathway from the wetland), and C is less than 2 miles, evaluate Wetlands 1 and 2 as two separate watersheds (i.e., draw a 15-mile TDL in each wetland). If the distance is greater than 2 miles, evaluate only Wetland 1. Continue evaluating the overland distance until the sum of distances for the hazardous substance migration pathway is greater than 2 miles.
- In Example 2, the PPE is in an isolated wetland. The 15-mile TDL is completely within the wetland. The length of wetland to be considered is the perimeter distance ABDCA (i.e., the length of the arc in the wetland and the perimeter of wetland bisected by the arc), assuming the entire wetland is subject to the same level of contamination (for wetlands with various levels of contamination, see **Highlight 8-68**).

ESTABLISHING ACTUAL AND POTENTIAL CONTAMINATION

The criteria for establishing whether a wetland (or portion of a wetland) is considered subject to Level I concentrations, Level II concentrations, or potential contamination generally are identical to those for a listed sensitive environment (see Section 8.15):

- Actual contamination can be established based on direct observation and/or surface water, benthic, or sediment samples taken within or beyond the wetland (or adjacent to the wetland if it is contiguous to the hazardous substance migration path).
- Level I concentrations can be established only if at least one hazardous substance in an applicable aqueous surface water sample is present at a concentration that is equal to or greater than the applicable ecological-based benchmark (i.e., EPA AWQL or EPA AALAC for the substance).
- Level II concentrations are established:
 - If the concentration of all applicable hazardous substances from all applicable surface water samples are lower than their respective ecological-based benchmarks;
 - If none of the applicable hazardous substances in all applicable surface water samples has an ecological-based benchmark; or
 - If actual contamination is established based on sediment samples, benthic samples, or direct observation.
- Potential contamination is established for wetlands within the TDL if Level I or Level II concentrations (i.e., actual contamination) cannot be established.

However, only those portions of wetlands subject to a given level of contamination are evaluated under that level of contamination (e.g., different portions of the same wetland can be evaluated under Level I concentrations, Level II concentrations, and potential contamination).

DETERMINING WETLAND LENGTH (OR PERIMETER) SUBJECT TO ACTUAL AND POTENTIAL CONTAMINATION

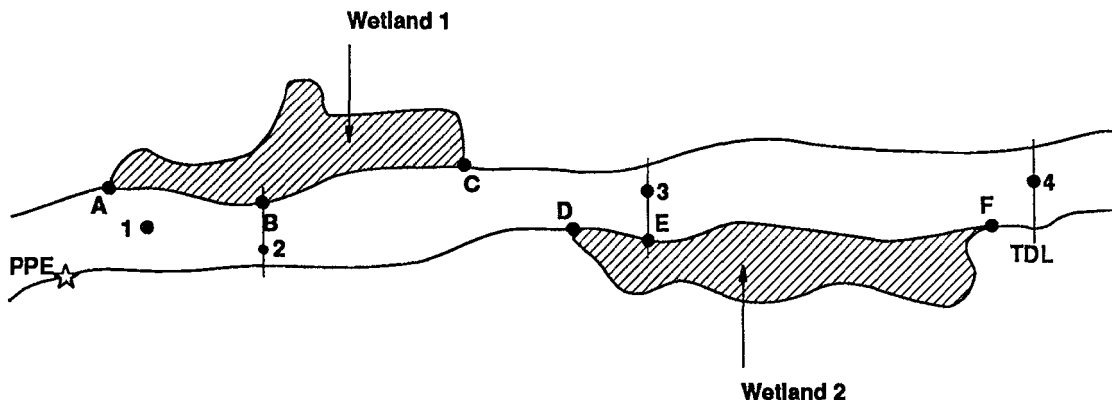
This section provides guidance for determining wetland length or perimeter associated with Level I concentrations, Level II concentrations, and potential contamination. **Highlights 8-66** through **8-68** provide examples of evaluations of wetlands contiguous to rivers, lakes or oceans, and isolated wetlands. For guidance on calculating the environmental threat targets factor value, see Section 8.14.

(1) Determine wetland length (or perimeter) associated with Level I concentrations.

- For rivers and streams, use the length of the wetlands contiguous to the in-water segment of the hazardous substance migration path (i.e., wetland frontage) from the PPE to the farthest downstream sample establishing Level I concentrations (see **Highlight 8-66**).
- For lakes, oceans, coastal tidal waters, and Great Lakes, use the length of the wetland frontage along the shoreline subject to Level I concentrations from the PPE to the intersection of the arc of the most distant sample establishing Level I concentrations and the shoreline (see **Highlight 8-67**).

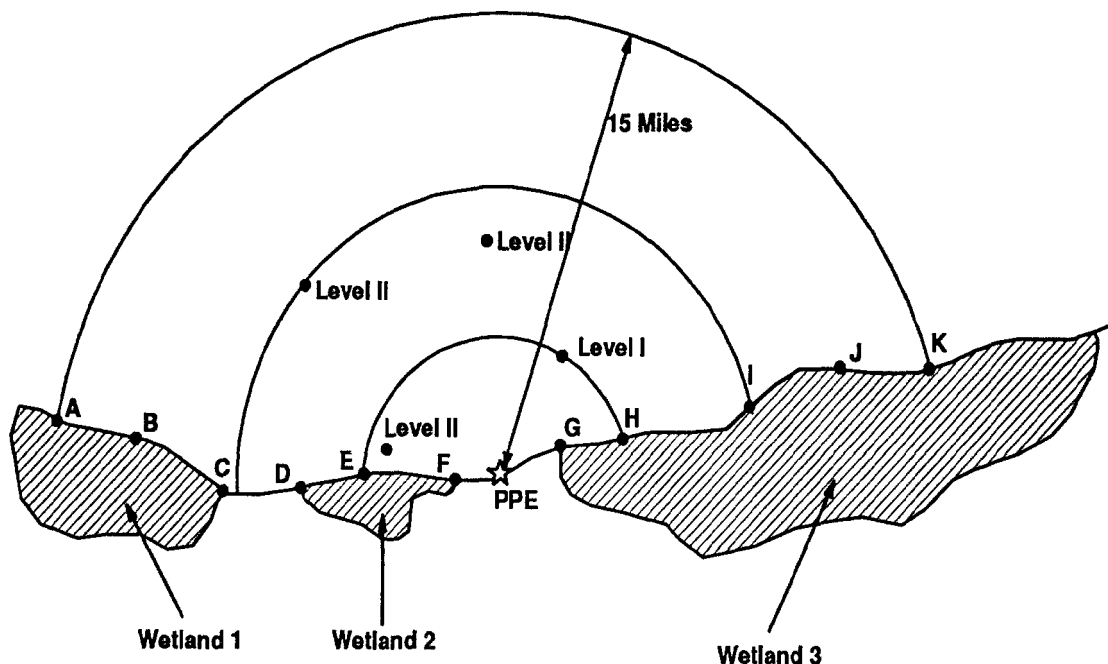
HIGHLIGHT 8-66

DELINEATING ACTUAL CONTAMINATION FOR WETLANDS IN A RIVER



- In this figure, two wetlands (Wetland 1 and Wetland 2) contiguous to a river are evaluated for actual and potential contamination.
- Point 2 represents the farthest downstream sample establishing Level I concentrations; Point 3 represents the farthest downstream sample establishing Level II concentrations.
- The wetland length considered subject to Level I concentrations is measured from the upstream boundary of Wetland 1 to the farthest downstream sample that establishes Level I concentrations (i.e., Point 2).
- Length considered subject to Level II concentrations is measured from the farthest downstream sample that establishes Level I concentrations to the farthest downstream sample that establishes Level II concentrations (i.e., Point 3).
- Potential contamination is measured from the farthest downstream sample that establishes Level II concentrations to the TDL (i.e., Point 4). However, if the TDL is greater than 15 miles due to samples that establish actual contamination, potential contamination is not scored.
- In this example:
 - The shoreline length A to B is subject to Level I concentrations;
 - The shoreline length B to C and D to E is subject to Level II concentrations; and
 - The shoreline length E to F is subject to potential contamination.
- In areas with both fresh and brackish water (i.e., tidal areas), the applicable benchmark for a given hazardous substance may be different in the fresh water portion of the river than the brackish portion of the river (e.g., a given concentration could be below the benchmark in fresh water but above the benchmark in brackish water).
- Special consideration should be given to tidal areas.

HIGHLIGHT 8-67 **DELINEATING ACTUAL CONTAMINATION FOR WETLANDS IN A LAKE, OCEAN, AND COASTAL TIDAL WATERS**



- For lakes, oceans, and coastal tidal waters, an arc bisecting the coastline is drawn from the PPE to the TDL. To determine the coastline subject to different levels of contamination, draw separate arcs, each with a distance equal to the length from the PPE to the most distant sampling point that establishes Level I and Level II concentrations, each arc bisecting the coastline.
- In this example, the lengths of wetland subject to Level I concentrations are the lengths E to F and G to H measured along the coastline (i.e., not a straight-line distance). Note that even though a sample that establishes Level II concentrations was found within the Level I concentration arc, the Level I concentration arc is determined by the most distant sample establishing Level I concentrations.
- Lengths of wetland subject to Level II concentrations are the coastline lengths D to E and H to I.
- Potential contamination includes those portions of wetlands outside the Level I and/or Level II arc(s), but within the TDL. In this example, lengths subject to potential contamination are A to B to C, and I to J to K.

- For an isolated wetland, or for a wetland where the PPE to surface water is in the wetland, use the perimeter of that portion of the wetland considered subject to Level I concentrations as the length. If the PPE to surface water is within a wetland and other wetlands within the TDL are subject to Level I concentrations, use the perimeter for the wetland in which the PPE is located and the length for all other wetlands within the TDL (see **Highlight 8-68**).
- See Section 8.1 if the surface water bodies being evaluated are tidally influenced.
- See Section 8.3 if both fresh water and salt water (or brackish) surface water bodies are within the TDL.

(2) **Determine wetland length (or perimeter) associated with Level II concentrations.**

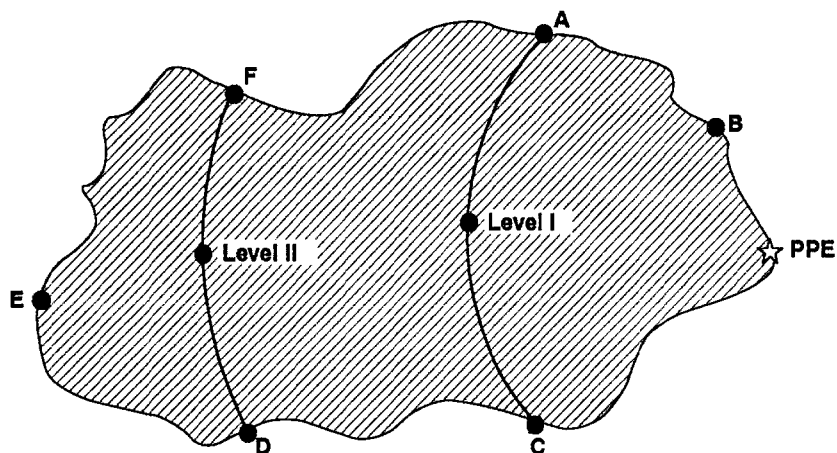
- For rivers and streams, use the length of the wetlands contiguous to the in-water segment of the hazardous substance migration path (i.e., wetland frontage) between the farthest downstream samples establishing Level I and Level II concentrations. In the absence of Level I concentrations, use the length from the PPE to the farthest downstream sample establishing Level II concentrations (see **Highlight 8-66**).
- For lakes, oceans, coastal tidal waters, and Great Lakes, use the length of wetland frontage along the shoreline between the farthest downstream samples establishing Level I concentrations. In the absence of Level I and Level II concentrations, use the length from the PPE to the farthest sample establishing Level II concentrations (see **Highlight 8-67**).
- For an isolated wetland, or for a wetland where the PPE to surface water is within the wetland, use the perimeter of the portion of the wetland considered subject to Level II concentrations as the length (see **Highlight 8-68**).
- See Section 8.1 if the surface water bodies being evaluated are tidally influenced.
- See Section 8.3 if both fresh water and salt water (or brackish) surface water bodies are within the TDL.

(3) **Determine wetland length associated with potential contamination.**

- For rivers and streams, use the length of wetlands contiguous to the in-water segment of the hazardous substance migration path. Include the length of wetlands within the TDL from the farthest downstream sampling point establishing actual contamination or from the PPE, if no sampling points establish Level I or Level II concentrations.
- For lakes, oceans, coastal tidal waters, and the Great Lakes, use the length of wetlands along the shoreline within the TDL not subject to Level I or Level II concentrations.
- For an isolated wetland or for a wetland where the PPE to surface water is within the wetland, use the perimeter of that portion of the wetland not subject to Level I or Level II concentrations as the length.
- See Section 8.1 if the surface water bodies being evaluated are tidally influenced.
- See Section 8.3 if both fresh water and salt water (or brackish) surface water bodies are within the TDL.

HIGHLIGHT 8-68

DELINEATING ACTUAL CONTAMINATION FOR WETLANDS WHEN THE PROBABLE POINT OF ENTRY IS IN THE WETLAND



- In this example, there is an observed release to an isolated wetland. To determine the perimeter of wetland subject to actual and potential contamination, draw an arc with a radius equal to the distance from the PPE to the farthest sampling point that establishes Level I and/or Level II concentrations. This arc will have the PPE as the center, pass through the farthest sampling point, and intersect with the wetland boundaries.
- For Level I concentrations, the perimeter is equal to those portions of the arc delineating Level I concentrations within the wetland plus the length of wetland boundary the arc intersects. For Level II concentrations, the perimeter is equal to the arc drawn from the PPE to the farthest Level II sample, the arc delineating Level I concentrations (if applicable), and the length of wetland boundary connecting these arcs.
- In this example, the arc delineating Level I concentrations is shown by arc A-C. Therefore, the length of wetland subject to Level I concentrations is shown by ABCA.
- The perimeter of the arc marking Level II concentrations intersects the wetland boundaries at points D and F. The perimeter of wetland to be considered for Level II concentration is shown by ACDF.
- Potential contamination is scored as the remainder of the isolated wetland and other surface water bodies within the TDL. For this isolated wetland, the perimeter of the wetland subject to potential contamination is FDEF.

TIPS AND REMINDERS

- A significant environmental threat score based solely on potentially contaminated wetlands can generally be achieved only with a large wetland area and a water body type of minimal stream or small to moderate stream.
- Under potential contamination, minimize efforts to identify and delineate wetlands unless the waste characteristics factor category value is greater than 100, and river size (or lake size) is less than a moderate to large stream.